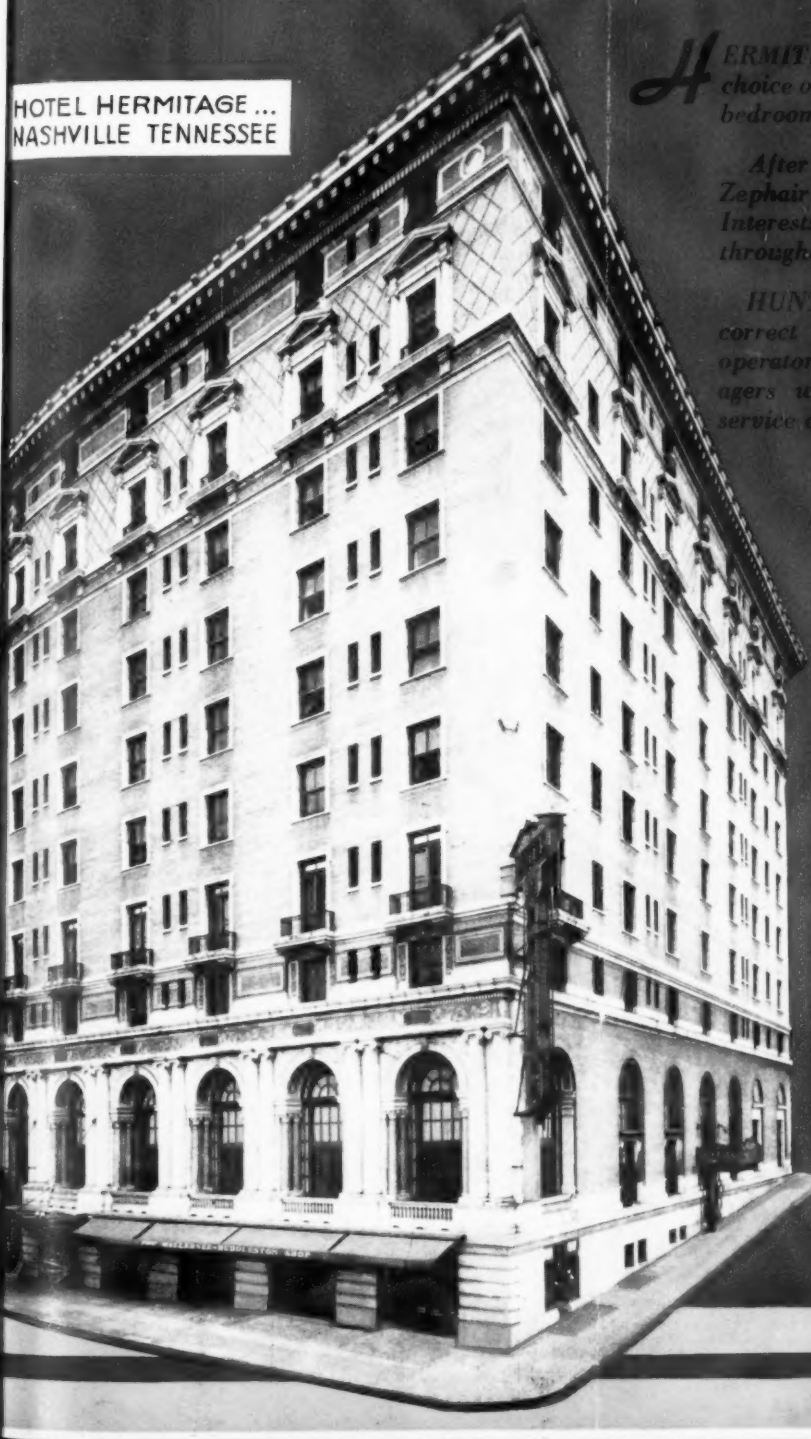
APRIL, 1941

# ELECTRICAL SOUTH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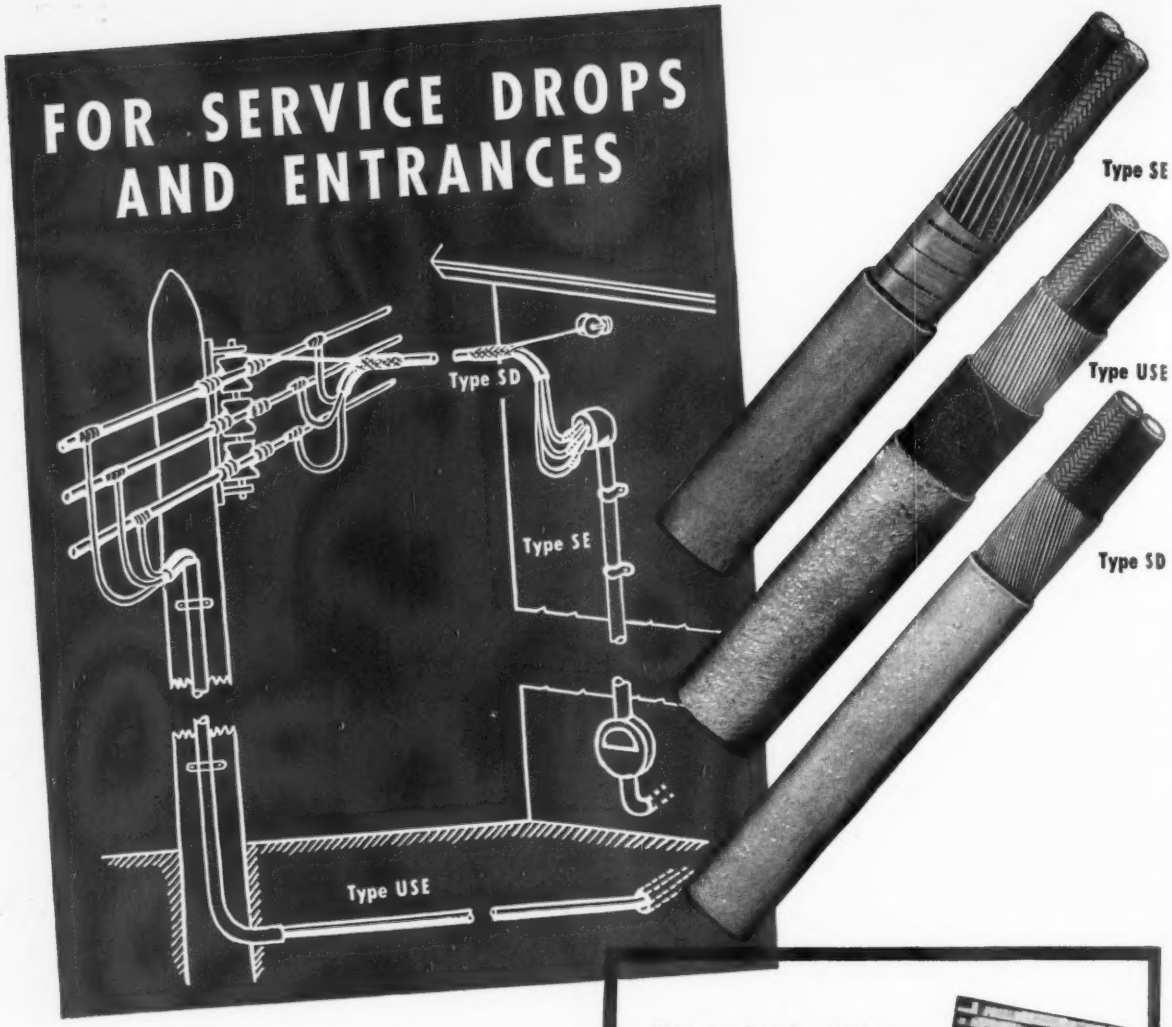


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Volume 21 Number 4.

# RIGHT IN YOUR OWN HOME TOWN

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### *In Every Place Where Hot Water Is Needed There's a Red Hot Prospect For You!*

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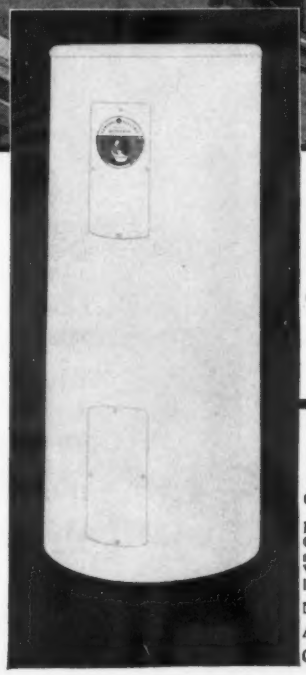
So don't pass up the lively prospects all around you. Let's get started! See your G-E distributor for new sales tools and display material. Write for new selling manual—free. Mail coupon at right today!

GENERAL ELECTRIC



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# ALUMINUM, DEFENSE, AND YOU

ALCOA

1

**WE INTERRUPT** our regular messages to report what's what with aluminum.

**AT THE MOMENT** delivery for civilian use must make way for defense. Everybody knows the reason. Defense requires and is using more aluminum per month than peacetime America ever consumed.

**NEVERTHELESS,** we intend that no one shall have to forego the things aluminum can do best one minute longer than we can help.

**THERE IS NO SHORTAGE** of bauxite, nor of anything else, except time. And Father Time is being given the race of his life.

**WE ARE MOVING,** for example, 35,000 yards of earth a day at Alcoa, Tenn., to get 50 acres under a single roof by September. It will require 193 carloads of roofing felt. Some of the operations in that plant will start even before the walls are up. That's an annual rolling capacity for 120 million pounds of high strength alloy sheet coming along fast.

**LAST MARCH WE STUCK** the first shovel in a cow pasture near Vancouver, Wash. In September a 30 million pound plant was delivering metal. It has been doubled, already. A third 30 million pound unit starts delivering in April; a fourth in May; a fifth in June. From cow pasture to 150 million pounds annual capacity in 15 months.

**A SIDELIGHT:** To make that 150 million pounds of aluminum, we first have to build factories to make 120 million pounds of carbon electrodes. We have to obtain the equipment (transformers, rectifiers, and the like) to feed 162,500 kw. of electricity into the reduction furnaces. This is a generating capacity equal to that of the state of Delaware plus twice that of Mississippi.

**WHAT OF TOTAL PRODUCTION?** In addition to Vancouver, further installations are being made at other of our plants, so that in less than a year their total capacity will be more than double that of 1939, when 327 million pounds were produced.

**IN THE VERY MIDST** of this demand we have lowered the price of aluminum ingot 15%. We state, without reservation, our hope that the price can be still further reduced.

**DEFENSE APPLICATIONS** use aluminum for exactly the same reasons you do. Defense priorities on aluminum simply say that there are some fundamental things that aluminum does supremely well. It will do them still better as important lessons in production, fabrication, and application are learned from every additional pound being produced and used.

**YOU, SIR,** have been using aluminum conductors and bus bars. It is not easy nor convenient to have to substitute other materials temporarily. We want you to know that we intend to make this hardship as short-lived as possible. Your aluminum is on the way. It is a promise.

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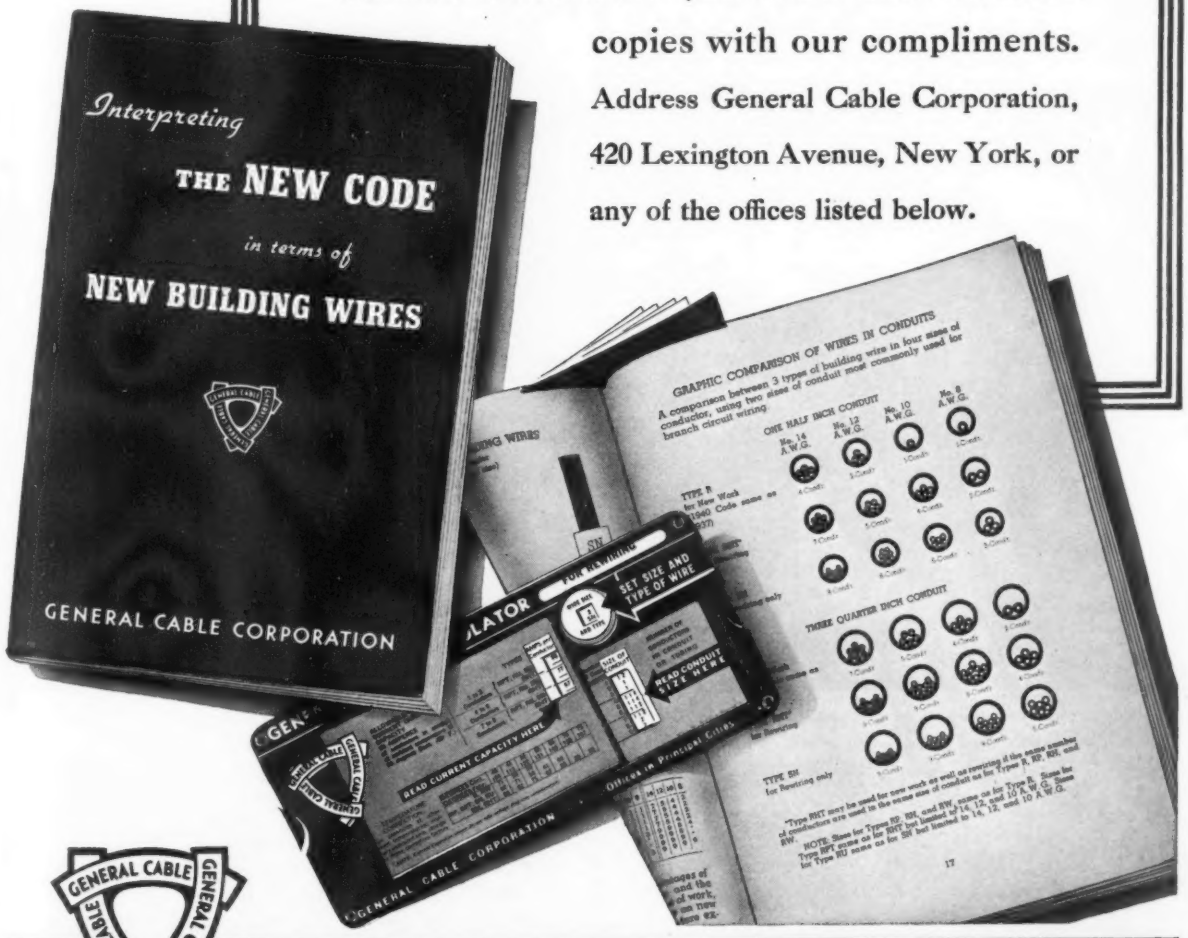


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**The metallographic microscope in Anaconda's studio magnifies samples 3000 diameters...makes possible the detection of heretofore undiscovered flaws and deficiencies in cable materials**

IN THIS PHASE of laboratory work, the engineer must have both the trained eye of the casting director and the skill of the make-up artist and cameraman. For, expert preparation of the metal sample is necessary before any revealing secrets will be given up to the observer. Then experience comes to the foreground to interpret what is seen.

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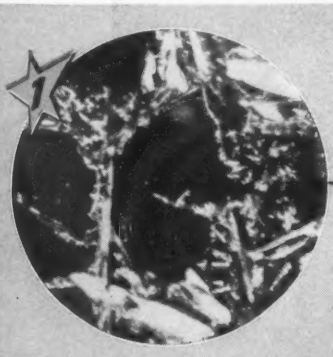


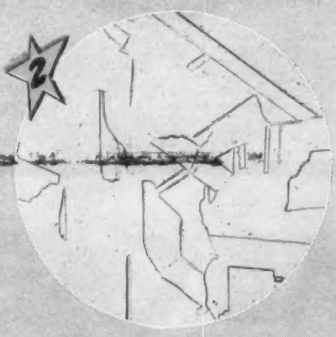


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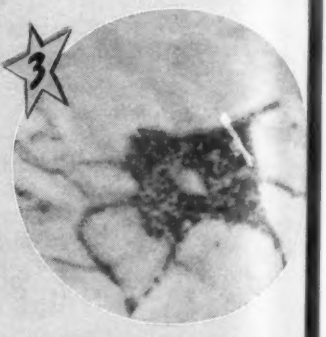


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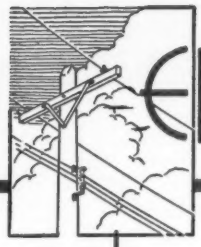
*APRIL, 1941*

Volume 21 No. 4



# ELECTRICAL SOUTH

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**YES, THIS PICTURE,** we admit, is a trifle far-fetched. But the fact is that customers who have installed *really* good lighting are continually amazed at the greater ease with which they can work and the better results they get.

Human beings, accustomed for ages to daylight outdoors, quickly sense improvements of lighting indoors and respond to them favorably in many ways. As indoor lighting approaches outdoor lighting, seeing becomes easier.

Today, although it is still impractical to provide daylight levels indoors, it is possible to

get as much as 50 footcandles or more . . . thanks to modern light sources and equipment. The more 50-footcandle installations that are sold, the closer we come to the goal of providing better light for better sight.

Fifty-footcandle installations are not hard to sell when you dramatize some of the fundamental Science of Seeing Facts for your customers. For example, how recently have you told your customers:

**THAT** *more than twice as much light is generally needed to read the stock market reports in a newspaper as is required to read front page news?**

**THAT** *handwriting in pencil usually requires nearly five times as much light to be as readable as the same handwriting in ink?*

*"We've been trying to get him to go home for weeks, but he won't believe it's night since we put in the new G-E Fluorescent Lighting!"*

**THAT** *merchandise displayed in good light sells faster than merchandise displayed in poor light because people can actually see it more quickly and decide faster?*

When you sell the man who runs a factory, store, or office, tell him that modern lighting is a powerful force that few people have even begun to use to full advantage. Show him how the additional expense of a 50-footcandle installation can be returned many times over in the form of reduced errors, increased sales or production, better, faster work with less fatigue, improved employee morale, and reduced accident hazards.

**HAVE YOU JOINED THE FORTY-NINERS' CLUB?**

The honor of membership in the Forty-Niners' Club is extended to any salesman who has been primarily responsible for selling an installation of 49-footcandles or more, or to any executive who works under 49 maintained footcandles. For full information, write to Secretary, Forty-Niners' Club, General Electric Company, Nela Park, Cleveland, Ohio . . . or consult your G-E Lamp Division for further details.

* See Chapter V, "The Science of Seeing" by M. LUCKIESH and FRANK MOSS.

***FREE*** sample of "The Seeing Spinner!" A new gadget to help show how better lighting speeds seeing. Write to General Electric Co., Dept. 166-ES-D, Nela Park, Cleveland, Ohio.

**G-E MAZDA LAMPS**

**GENERAL ELECTRIC**

*Made to stay brighter longer*

**MAZDA . . . NOT THE NAME OF A THING, BUT THE MARK OF A RESEARCH SERVICE**

# AN EXPERIMENTAL LABORATORY FOR RURAL ELECTRIFICATION

***Erected through joint efforts of utilities and extension workers, it helps teach farm folk the uses, features, and operating economies of electrical appliances on the farm.***

**By William M. Corwin**

AN EXPERIMENTAL laboratory and teaching center that could be a salesman's paradise, but actually is a farm family's schoolroom and playhouse—such is West Virginia's rural electrification laboratory, constructed a year ago by the state's agricultural extension division and electric utilities at the famous Jackson's Mill Four-H camp, to provide a place where agricultural leaders and utility workers may study ways and means of making electricity work efficiently on the farm and in the farm home and pass on this knowledge to farmers and their families.

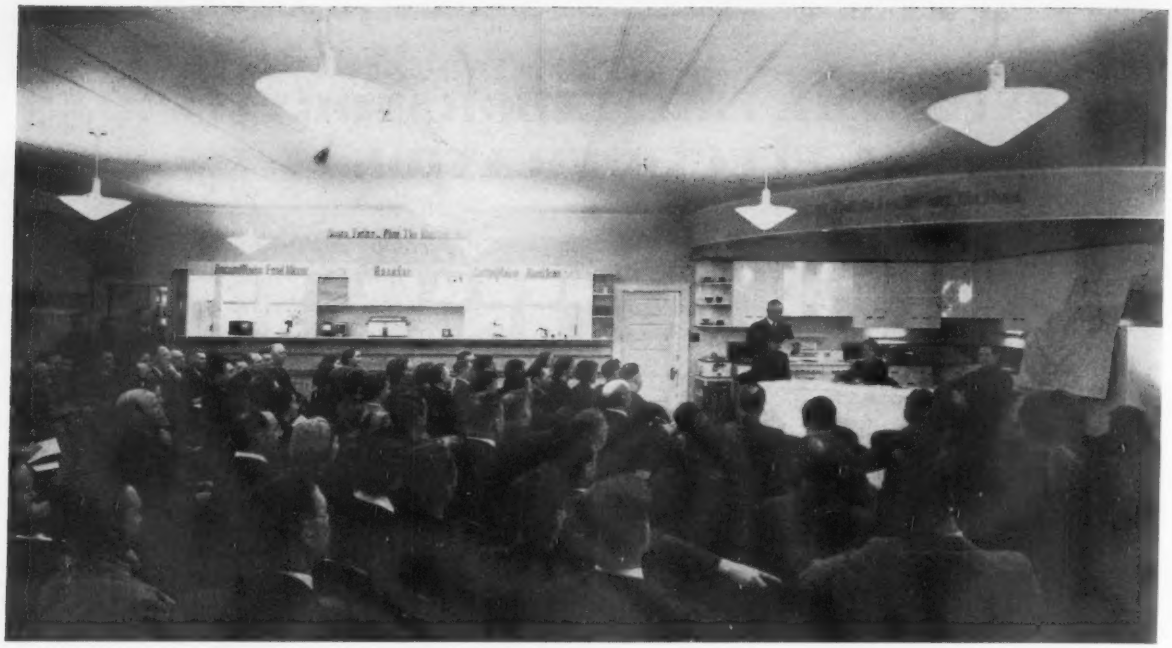
The laboratory is the first demonstration center of its kind in the country erected through the joint efforts of utilities and extension workers, and furnished through the cooperation of electrical appliance manufacturers and dealers. Its job is to teach the farm folks the uses, features, operating economies and the efficiencies of electricity and electric appliances. Trained home economists and men skilled in the use and operation of electric farm machinery comprise the laboratory staff to explain its many features and to teach classes for the thousands of youth and adults who visit the camp each summer for a five-months series of meetings.

At the end of the laboratory's first season, a total of 4,790 persons from 54 of West Virginia's 55 counties had registered at the building, and it's doubtful if that figure represents anywhere near 50 per cent of those who actually visited the structure or made use of its facilities.

Three county farm groups and a dozen miscellaneous organizations made extensive "tours" through the laboratory, witnessing many of the demonstrations. Ten counties sent special groups for one-day study periods on some phase of the laboratory or its equipment.

Classes in some phase of rural electrification, such as the use, care, and operation of appliances, proper wiring and lighting, and principles of electric motors, were conducted throughout ten of the

**A portion of the Jackson's Mill camp ground, location of West Virginia's rural electrification laboratory where facilities made available by electrical utilities, manufacturers, and extension personnel, are put to use in the instruction of rural folk in the uses, features and operating economies of electrical appliances. The "laboratory" is located directly behind the Mt. Vernon dining hall near the center of the photograph. The boyhood home of the great Confederate general, Thomas Jonathan "Stonewall" Jackson, stood near the extreme left bottom corner.**



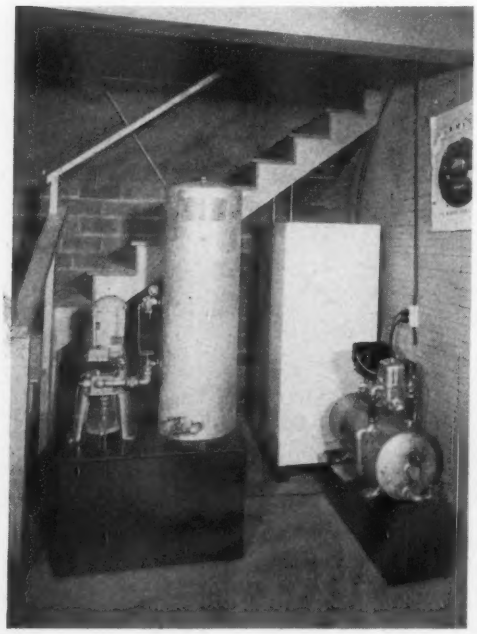
**Main auditorium of the rural electrification laboratory during a session of the 1940 West Virginia rural electrification conference. On the stage, background of which is a modern electric kitchen, are Russell H. Gist, standing, W. Va. district agricultural agent, Miss Gertrude Humphreys, W. Va. director of home demonstration work, and Russell H. Ellyson, state Farm Security Administration director.**

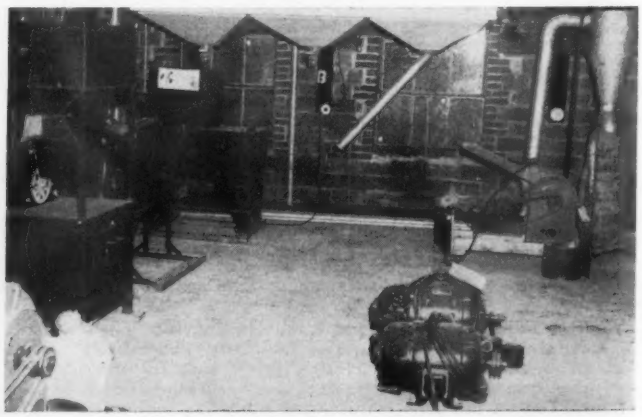
one-week camps in vogue during the season. For the summer of 1941, the class schedule will be greatly expanded.

The story of West Virginia's rural electrification laboratory began in 1937 when the first statewide conference on rural electrification was held at Jackson's Mill, which, by the way, is the largest Four-H camp of its kind in the world. An obscure sub-committee, entrusted with the task of recommending methods of providing training for farm families whose homes were being connected to the electric lines, proposed the equipping of an experimental laboratory for such a purpose.

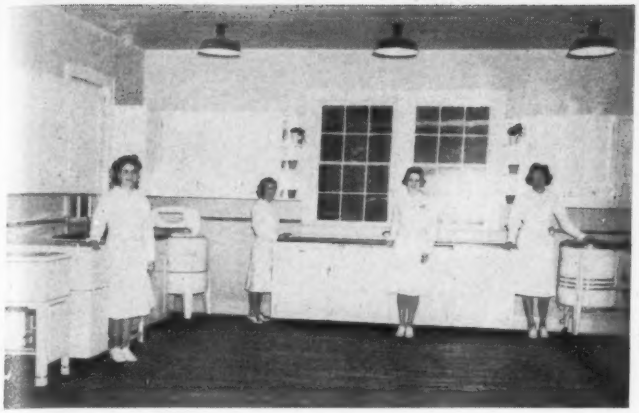
Neither extension service or utilities wanted the responsibility of the laboratory purely as a promotional scheme, but a compromise was reached whereby the extension service and the utilities would construct and staff the building, and the utilities and manufacturers would equip it.

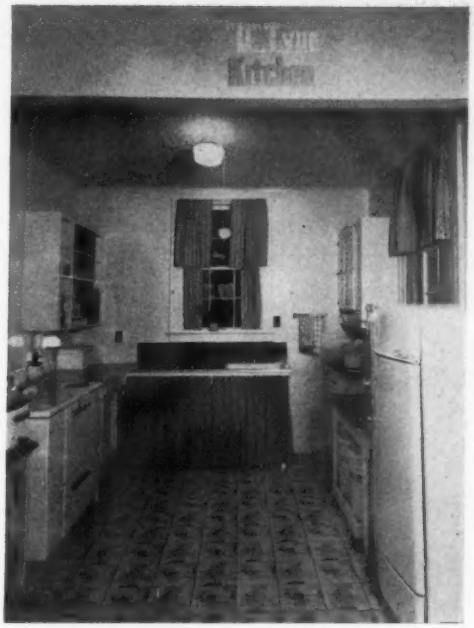
The building itself remained only a dream on paper until last year, although in mid-summer of 1939, the West Virginia Rural Electrifi-





**Practically every farm use for electric service can be demonstrated in this rural electrification laboratory. Below, one corner of the "barn" center showing hammer mill, feed grinder and mixer, corn sheller, and heavy duty farm motors. At left, a water pump installation connected for actual operation. Dairy and poultry-raising equipment can also be demonstrated.**





**Not one but three complete electric laundries are installed in the laboratory. One of these is shown below with several of the laboratory assistants who demonstrate the equipment and explain its features. At right is the laboratory's "U" type kitchen. This is one of the least expensive kitchens on display, one which might appeal to the lowest income group.**

cation Committee took over an uncompleted cottage at the Mill camp, filled one room with kitchen and laundry equipment, another with farm machinery, and a third with lighting fixtures to show the value of proper illumination, and held "open house" for a couple of months to see how such a project would be received.

From the first, the cottage was the mecca for campers and visitors alike, and despite cramped quarters, classes were scheduled for men in the "farm headquarters" and for women and girls in the kitchen-laundry center. The enthusiasm that greeted the makeshift exhibition was the spark which kindled anew the fire of creation and, before the year was out, work was started on the laboratory that was dedicated in April, 1940, at sessions of the annual state rural electrification conference.

Just what does the laboratory contain? On the main floor there is an auditorium seating about 250 persons and suitable for meetings and classes, a lighting demonstration room and classroom, four complete electric kitchens, a nutrition kitchen and an electric laundry center with three complete elec-

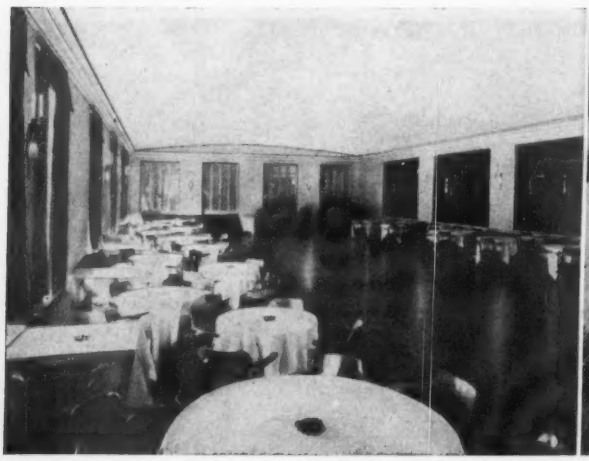
*(Continued on page 65)*

**This entire room is devoted to lighting and wiring. The frames on the left wall demonstrate the principles of adequate wiring and exhibit approved devices and methods. A variety of lighting fixtures are displayed throughout.**

# Exchange Conference in Augusta Offers Many Attractions

COMING at a time when American industry is confronted with the gigantic task of quickly setting up the bulwarks that will preserve it and protect American society, the annual conference of the Southeastern Electric Exchange, on May 1, 2, 3, will present a program of outstanding interest with particular emphasis on the utility industry's part in the National Defense Program. Economic, operating and engineering problems now facing the industry will be discussed.

Among those who will address the conference is Ex-Governor Clifford Townsend, of Indiana, now special advisor of the Labor Division, Office Production Management, Washington. Mr. Townsend will discuss the impact of the defense program on the economic future of the South. Other speakers include C. W. Kellogg, president of the Edison Electric Institute, and chief consultant for power units of OPM, whose subject will be the utility industry's part in national defense, and W. E.



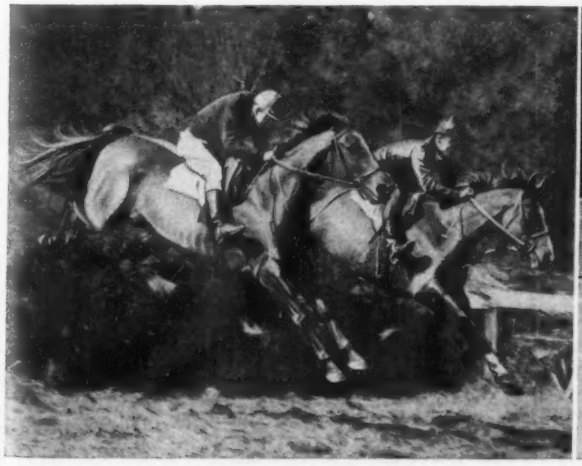
Mitchell, vice-president and general manager of Georgia Power Co., who will discuss operating problems brought about by the national emergency.

Featured speaker at the annual banquet, scheduled for Friday evening, will be Hilmar R. Baukhage, NBC commentator on foreign and domestic affairs, Washington. He will relate what he saw and heard in Europe, its relation to the present war, and its possible significance to the economic and political life of the United States.

Among the speakers, who have accepted invitations to address the conference, and their subjects, are: E. R. Dunning, vice-president, N. W. Ayer & Son, New York, utility-customer-employee relations;

(*Continued on page 61*)

**Aerial views of the Bon Air Hotel and the main street of Augusta, Georgia, are shown above. The recreational facilities available to guests are many and varied. Golf, of course, leads all the others. Four marvelous golf courses are available including the Augusta National.**



# The Forty-Niners of 1941

***Recognizing that good lighting to be appreciated must be experienced, General Electric initiates the "Forty-Niner Club" with membership open to anyone in the industry who uses or sells a lighting job of 50 foot-candles or more.***

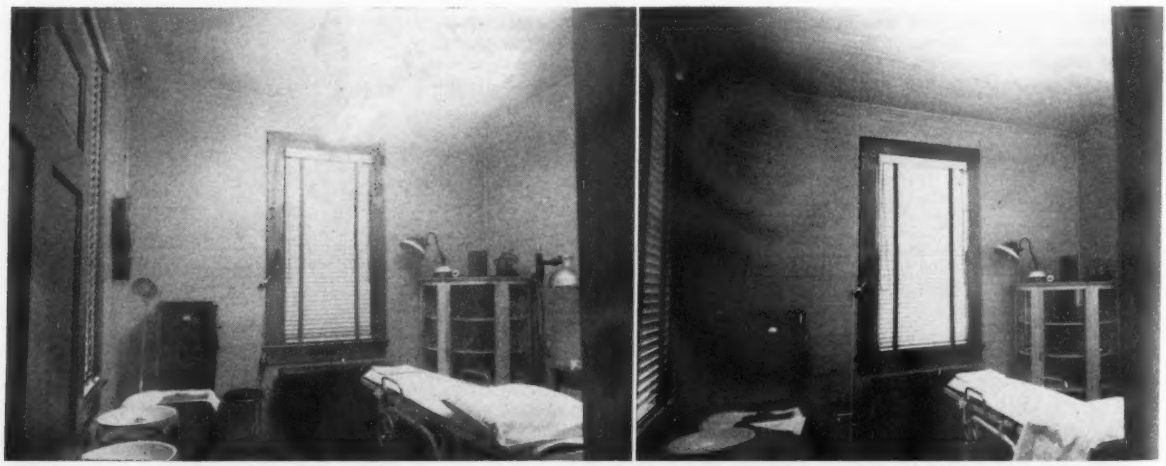
ONCE again the pioneers of Georgia have rushed the gold-bearing hills of Dahlonega. Unlike their predecessors, who have sought and found gold in this North Georgia town from time to time during the past hundred years, these pioneers carried not picks and placer pans but foot-candle meters and Better Light-Better Sight literature.

This activity in Dahlonega by lighting salesmen of the Georgia Power Company marked the opening of an intensive lighting sales effort supplementing the "Forty-Niners of 1941" campaign, recently announced by General Electric's Lamp Department.

The first lighting job installed under the rules of the campaign, which has as its objective the stimulation of interest in lighting levels above 50 foot-candles, was in the examination room of a Dahlonega physician. The difference in the "before" and "after" pictures shown below may not indicate the contrast in the old and new lighting of this office, but the light meter indicates a maintained average of 55 foot-candles where there were only five before.

It was particularly appropriate that the Georgia Power lighting salesmen sought in Dahlonega their first installation in the "Forty-Niners of 1941" campaign, which takes its name from the hardy, adventurous gold-mining pioneers of 1849, for this North Georgia town has been the scene of gold-mining activities since 1828 when gold was first discovered on what was then Cherokee Indian territory. Rapid settlement and development in this area followed the gold strike, and in 1838 the United States government established a mint in Dahlonega which operated continuously until 1861, minting a total of $6,115,569 in gold coins. In 1840, gold mining operations in this locality were producing as much as $500,000 annually, but in 1927 this had decreased to as little as $300. The mining town made front pages again last year with the announcement of a new strike assaying $60,000 per ton. A recent check-up indicates that there are some 40 active mines in this area now, although less than half that number are on a commercial production basis.

Like the Forty-Niners of 1849, who were willing to take risks in exploring new fields, the modern Forty-Niner is a pioneer who seeks and discovers the rewards which good lighting brings to those who know the importance of well-de-



**Increased interest in higher levels of illumination for commercial and industrial establishments is one of the objectives of General Electric's "Forty-Niners of '41" campaign. This was the first qualifying installation sold by Georgia Power Company lighting salesmen. At left is the relighted examination room of a prominent physician in Dahlonega, Ga. The contrast with the old lighting installation, at right, is not so marked in the photographs but the light meter shows maintained average of 55 foot-candles where there were only five before. Three pendant luminaires, each equipped with four 40-watt fluorescent lamps and corrected for power factor were installed.**

signed systems of adequate levels.

In the olden days, the Forty-Niner was anyone who made the effort whether he produced results or not. But in General Electric's Forty-Niner campaign, one can become a Forty-Niner only by accomplishing results through the use or the sale of adequate lighting. Membership in the Forty-Niners' Club is open to any lighting salesman (utility, distributor, or manufacturer) who is primarily responsible for selling a well-designed lighting installation totaling 49 or more maintained foot-candles.

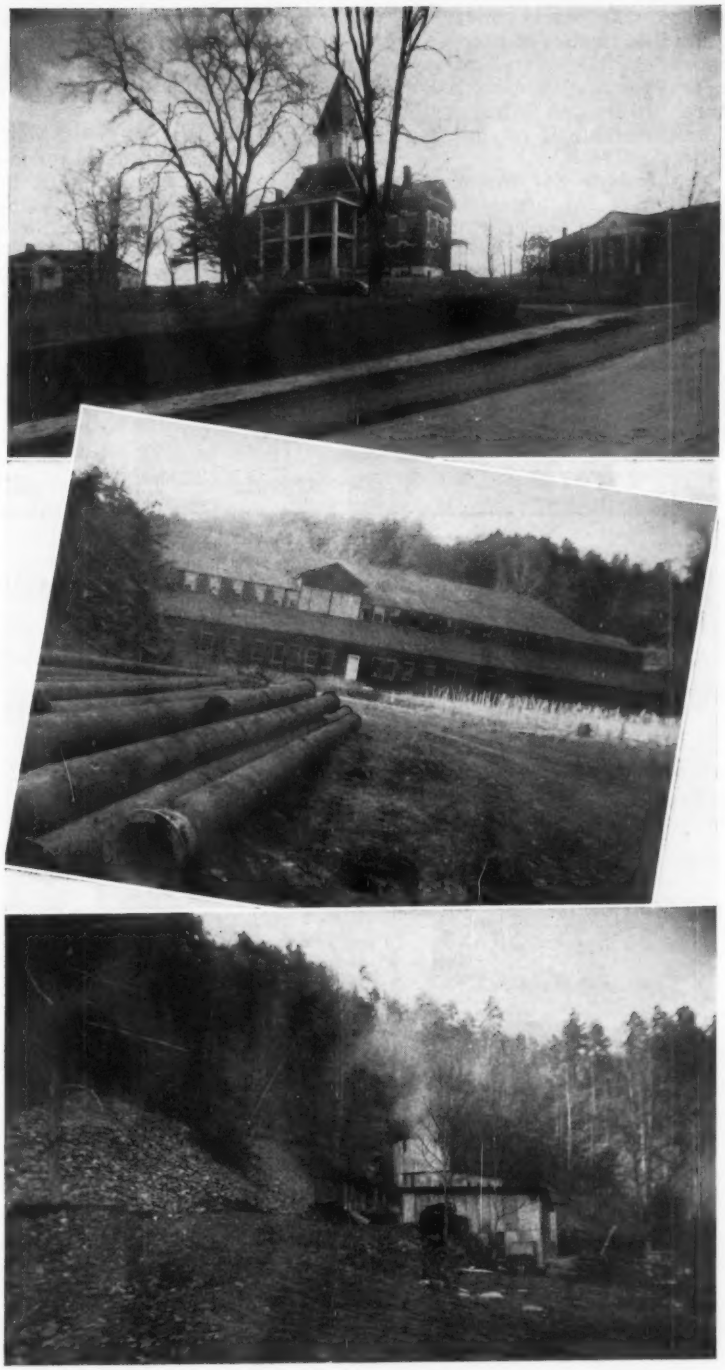
While the rules and regulations for membership in the Forty-Niners are based on lighting levels sold and used—49 foot-candles or better—this exact level of lighting is, of course, not the important thing. The objective is to focus attention on 49 foot-candles as a definite mechanism for obliging ourselves to really **know** fundamentals of the science of seeing and to be able to understand and explain its benefits. While the benefits of higher levels of lighting apply throughout all fields, we are focusing attention primarily on lighting for commerce and industry.

In order to qualify for membership, a salesman must fill out a simple application blank, have it approved by his sales manager, and forward it to Nela Park. An installation, in order to qualify, must have been sold since September 1, 1940, and must be for 49 maintained foot-candles or more of general lighting for at least:

200 sq. ft. of office space
500 sq. ft. of commercial space
2,000 sq. ft. of industrial space.

For the purpose of qualifying members, schools, libraries, and similar occupancies are counted as commercial space.

While the initial membership in the Forty-Niners will be those who explain and sell the benefits of modern levels of illumination, any



**Because General Electric's "Forty-Niners of 1941" campaign was named for the hardy, adventurous gold-mining pioneers of 1849, it was particularly appropriate that Georgia Power Company lighting salesmen sought their first qualifying installation in the historic gold-mining town of Dahlonega, Ga. These views in and near Dahlonega bring many interesting facts to mind about this locality where gold was first discovered in 1828. At top, the Administration Building of the North Georgia College stands on the site of the old United States mint which turned out $6,115,569 in gold coins between 1838 and 1861. At center, the old Consolidated Mine building. Below, one of the more than 40 mines in this locality still in operation. The town made front page news again, recently, when a new strike assaying $60,000 per ton was announced.**

person who works under 49 or more foot-candles of general lighting is eligible.

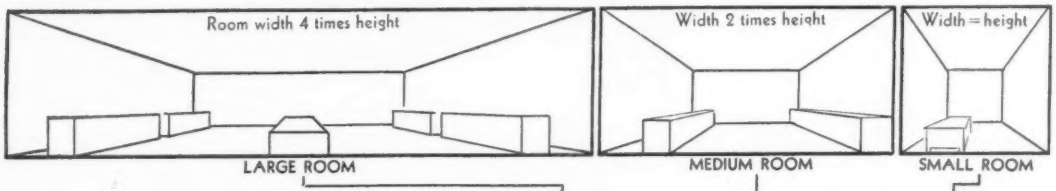
Every executive, every manufacturer, utility and jobber is eligible to membership if his lighting entitles him to it.

An emblem for the lapel, significant of the organization, has been designed and is available. In its design is a replica of a gold nugget on which is superimposed the numerals 49, with a background of a white fluorescent lamp. The emblem, while attention compelling, is small enough and neat enough to be worn proudly.

There are no restrictions as to type of lighting required for membership in the Forty-Niners. One can sell, or use candles, oil lamps, flaming pine knots, carbon, incandescent, or fluorescent lamps—any form of artificial light. Generally, of course, the higher levels will be easiest of accomplishment with the fluorescent lamp. Hence, the fluorescent lamp is part of the emblem. This, however, does not rule out any other forms of artificial light.

Forty-Niners will be invited to submit photographs of their outstanding installations to Nela Park for a special essay in 1941's awards. The ten best installations received before May 1st will be

(*Continued on page 65*)




| FIXTURE | Large Room: Light† Finish | Large Room: Medium‡ Finish | Medium Room: Light Finish | Medium Room: Medium Finish | Small Room: Light Finish | Small Room: Medium Finish |
|---|---|---|---|---|---|---|
| | SQUARE FEET PER 40-WATT WHITE MAZDA F LAMP* TO GIVE 50 FOOTCANDLES IN SERVICE | | | | | |
| Closed End Unit (0% Upward, 79% Down) / Open End Unit (0% Upward, 80% Down) | 23 | 22 | 20 | 18 | 16 | 15 |
| Glass Louvers – White Reflectors (17% Upward, 65% Down) / Open Louvered Troffer (0% Upward, 65% Down) | 19 | 18 | 16 | 15 | 13 | 12 |
| Half Cylinder Plastic or Glass (23% Upward, 43% Down) / Wedge Unit Glass (29% Upward, 43% Down) / Open Top – Diffusing Bottom (54% Upward, 27% Down) / Open Top – Open Louvered Bottom (45% Upward, 25% Down) | 14 | 11 | 11 | 9 | 9 | 7 |

**HOW TO USE THIS TABLE**

Divide the total square feet to be lighted by the value from this table to determine the number of 40-watt white MAZDA F lamps to be used. The number of fixtures required can thus be quickly calculated, depending on the number of lamps per fixture.

For example, if 6-lamp open-top, diffusing-bottom units are used to light a store 30 by 70 feet with a 13-foot ceiling and light walls and ceiling, the procedure is:

Number of lamps required for 50 footcandles = $\frac{30 \times 70}{11} = \frac{2100}{11} = 191$

Number of fixtures = $\frac{191}{6} = 32$

Thus 32 of these fixtures should be placed at existing outlets or located to give uniform lighting and a pleasing arrangement.

* Using 40-watt 48-inch white MAZDA F lamps. If 40-watt daylight lamps are used, about 20% more lamps are needed. The average illumination in service will be around 50 footcandles. Due to depreciation of lamps and fixtures, the initial footcandle levels will be appreciably higher.
† Light ceiling (75%) and wall (50%) finish.
‡ Medium ceiling (50%) and wall (30%) finish.

**This handy guide, published through the courtesy of the General Electric Company, provides a convenient method of making an approximate calculation of the number of fluorescent lamps required for a 50 foot-candle lighting installation, such as needed to qualify for Forty-Niner Club.**

# YEAR-ROUND AIR CONDITIONER MADE-TO-ORDER FOR THE SOUTH

***Utilizing the so-called "reverse cycle" for extracting heat from cold outside air, this new combination room cooler and heater has great load building possibilities.***

By P. Y. Danley

Manager Air Conditioning Department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

EVER since the discovery of the principle of the "heat pump" a century ago, the idea of making use of the heating effect of a refrigerating machine has fascinated engineers the world over. The thought of getting something for nothing is well-nigh irresistible. That, literally, is what we can do with reverse refrigeration—get a lot of "free heat" for a relatively small expenditure of electrical energy. For every unit of energy spent in driving the pump, several extra heat units are thrown in for good measure, and the result is the most efficient possible use of electricity to produce heat.

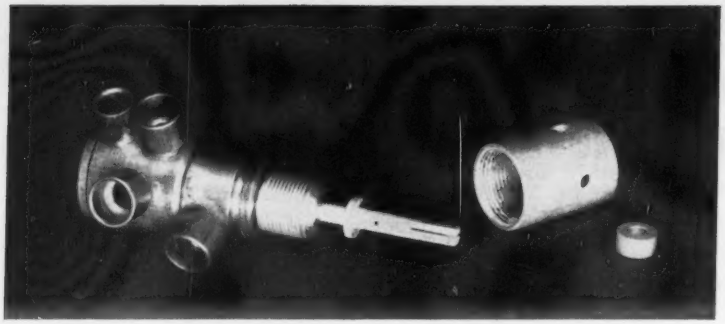
We frequently speak of the process of using the heat of refrigeration as "reversing the refrigeration cycle." What we really mean is that we reverse the functions of some of the elements of the cycle—but the cycle remains unchanged. We merely make different uses of the heat transfers that take place in the various stages of the cycle. The gaseous refrigerant is compressed, passes into the condenser and gives up its heat of evaporation to the surrounding medium—air or water—and condenses into a liquid—is squeezed through a restricting device and allowed to expand and evaporate and, in the process, absorbs heat from the surrounding medium—air or water. Whether we use for our purposes the heat absorption of the vaporizing part of the cycle or the heat release of the liquefying stage, the cycle does not change.

### Central-Unit Installations

A number of very fine installations of reverse refrigeration for summer cooling and winter heating are in use in various parts of the country today. These installations are divided in two classes, according to the medium used—air or water—for exchanging heat with the refrigerant. Systems using water as the medium have water-cooled condensers and water-cooling evaporators. In warm weather, the cooled water from the evaporator is circulated through the conditioned space and the hot condenser water is discarded. In cold weather the process is reversed—the hot condenser water is used for heating the conditioned space and the cooled water from the evaporator rejected. Heat is extracted from one water stream and transferred to the other—the reversal of functions is accomplished by exchanging the water streams.

Systems using air as the medium of heat transfer operate in the same manner—one air stream flows through the evaporator giv-

**A mere twist of the dial converts this new Westinghouse Mobilaire, a window-type room air conditioner, from a room cooler to a room heater. In milder climates, it can be used for cooling or heating all the year around. Even in colder climates it has many hours of potential use in the "in-between" seasons when central heating plants are not in use.**



**This small ingenious valve is the heart of the reverse cycle room cooler. By means of it, the flow of the refrigerant may be reversed. When turned to the cooling position, the coil in the room side of the unit becomes the evaporator and a similar coil in the outdoors side of the unit becomes the condenser. In the opposite position, for heating purposes, the valve changes connections so that the inner coil becomes the condenser and the coil in the outdoors side of the unit becomes the evaporator. In this latter position, the unit will deliver into the room several times as many heat units per watt as could be obtained from resistance-type heaters.**

ing up its heat to the evaporating refrigerant, and the other through the condenser absorbing heat from the hot compressed gas. An exchange of the air streams produces the change from cooling to heating, and does it automatically when the thermostat calls for a change.

These installations have proved to be thoroughly practicable where the heating load does not greatly exceed the cooling load and the heat transfer medium is 40° F., or above, in the case of air, and 45° F., or more, in the case of water. With these conditions satisfied, the cost of electrical energy in relation to other fuels is the sole determining factor.

### Room Conditioning Opens Big Field

But there still remains another and, I believe, even more practical means of using both the cooling and heating effects of the refrigerating machine—and that is the means employed in the reverse-cycle room cooler that changes from cooling to heating by the turn of a dial. This very interesting new application of an old principle brings reverse refrigeration into a field where investment and operating costs are not a major consideration and it does not have to Add 1——Reverse Cycle— „South be measured entirely by the economics involved. The reversal of functions in the reverse-cycle room cooler is accomplished by the simple expedient of reversing the direction of flow of the refrigerant within the cycle and causing the evaporator to take over the duties of the condenser, and the condenser, those of evaporator.

This new plug-in type of room cooler is mounted in the window so that the part containing the condenser is outdoors and the part containing the evaporator extends into the room that is to be cooled or heated. When the unit operates as a room cooler, the hot, compressed gas flows in a normal manner from the compressor to the condenser outdoors, liquefies and gives up its heat to the outdoor air, squeezes through the capillary tube and expands into the evaporator indoors absorbing the heat from the room air and returns to the compressor. As a room heater, the unit continues to operate in the same manner, except that the direction of flow of the refrigerant is reversed—the hot gas from the compressor goes first to the evaporator indoors, gives up its heat to the room air, condenses and flows backwards through the capillary tube to the condenser outdoors where it evaporates and absorbs heat from the outside air.

All of this sounds very simple

**P. Y. Danley, manager of Westinghouse's air conditioning department, shows Frank R. Kohnstamm, merchandise sales manager, how a twist of the dial changes the operation of the unit from cooling to heating.**

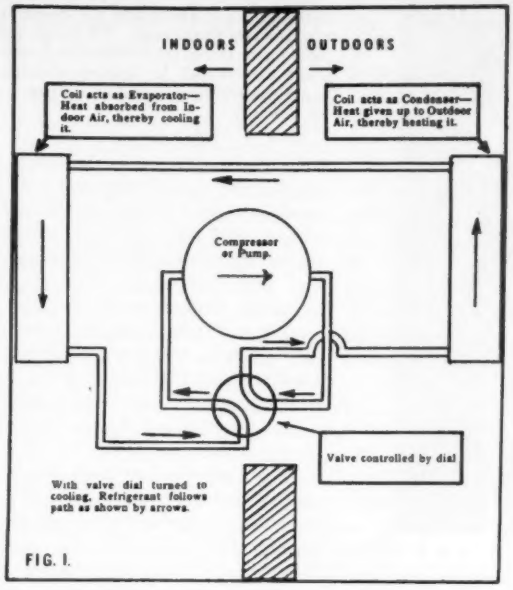

INDOORS
OUTDOORS
Coil acts as Evaporator—Heat absorbed from Indoor Air, thereby cooling it.
Coil acts as Condenser—Heat given up to Outdoor Air, thereby heating it.
Compressor or Pump.
Valve controlled by dial
With valve dial turned to cooling, Refrigerant follows path as shown by arrows.

FIG. I.

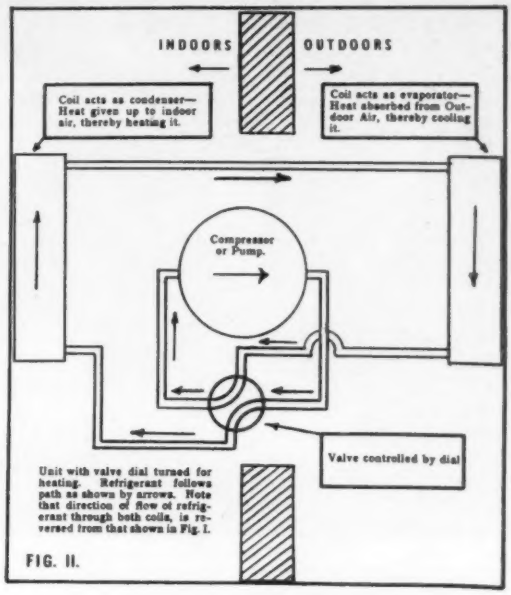

INDOORS
OUTDOORS
Coil acts as condenser—Heat given up to indoor air, thereby heating it.
Coil acts as evaporator—Heat absorbed from Outdoor Air, thereby cooling it.
Compressor or Pump.
Valve controlled by dial
Unit with valve dial turned for heating. Refrigerant follows path as shown by arrows. Note that direction of flow of refrigerant through both coils, is reversed from that shown in Fig. I.

FIG. II.

These two diagrams illustrate how, by a simple twist of the dial, the unit can be converted from a room cooler to a room heater. At left, the valve is set for cooling the room. Liquid Freon gas from the outdoor condenser coil passes through the tube to the indoor evaporator coil. Here, it evaporates, absoring heat from the room air which passes over it, thus cooling the air.

After evaporation, the gas, now at low pressure, is pumped through the compressor where it becomes high pressure or "hot" gas. It then passes through the valve again, thence to the outdoor condenser coil. Outdoor air passing over this coil removes the heat from the gas which was absorbed from the room air which passed over the condenser coil.

Thus, in this cycle, the Mobilaire cools the interior of the room and heats the outdoors.

In the diagram at the right, the dial has been turned and the valve set for heating the room. This has reversed the cycle of refrigerant flow so that the outdoor coil now becomes the evaporator and the indoor coil the condenser. Note that the compressor operation is not altered—only the direction of refrigerant flow.

With the outdoor coil now the evaporator, the Freon, in evaporating, absorbs heat from the outdoor air which passes over it. Still retaining this heat, it is then pumped back through the valve to the compressor, then, as high pressure gas, through the valves to the indoor coil which is now the condenser.

The room air, passing over this coil, picks up the heat in the Freon, and sends it into the room. This process converts the high pressure Freon into a liquid, which passes to the outdoor evaporator to complete the cycle.

Thus, in this cycle, the Mobilaire heats the interior of the room, and cools the outdoors.

—and it is extremely simple in operation—but the task of reversing the flow of refrigerant in an hermetically-sealed system without resorting to stuffing glands or running seals is not an easy one. It is accomplished by a small valve, about the size of a shot-gun shell, actuated by a shaft through a bellows, which opens and closes the refrigerant paths and causes the unit to transfer heat in or out, to suit the comfort of the user. If left in an in-between position, the valve simply allows the gas to pass directly from the discharge to the suction side of the compressor without imposing any burden on the parts.

The reverse-cycle window-type room cooler is capable of absorbing 6,000 BTU's of heat per hour from the room air at standard conditions of 95° F. outdoor temperature and 75° F., 50% relative humidity, indoors—and, when operated in reverse, will deliver up to 9,200 BTU's of heat per hour to the room air, enough to heat the average room comfortably as long as the outside temperature does not fall below 40° F. The heating effect is from two to three times as great as that obtained from resistance heating of the same wattage, because of the ability of the machine to absorb heat from the outdoor air with only a relatively small amount of power required to drive the pump.

Executives of the electric power industry have been giving some thought to the possibilities of the low-cost room cooler as a load builder for the future. It doesn't tax the imagination too much to think of the room cooler as becoming almost a necessity in those offices where central plant cooling has not been installed, and, once adopted in the home, it will surely spread from room to room. There are those, however, who point to the relatively short season of usefulness in the cooler climates and who question the desirability of the load as well as the existence of a need for the comfort and health it provides. They fail to take into account the almost year-round usefulness of the air-cooled room cooler as a window ventilator to bring in fresh, filtered outdoor air or to expel stale, smoke-laden indoor air. There is a growing consciousness of the need for vitalizing the room air in all seasons, and filtering out the dust and dirt.

*(Continued on page 22)*

A. F. Beyer, right, of Beyer Company, San Antonio, Texas, explains the features of an evaporative air cooler to a prospective customer. Through a definite sales plan, this company has been most successful in selling residential and small commercial cooling jobs.

# Neighborhood Follow-Up Plan Promotes Air-Cooler Sales

By B. C. Reber

TAKING advantage of opportunities has long been recognized as one of the most essential features of successful merchandising. In San Antonio, Texas, the Beyer Company recognized an opportunity in small evaporative air cooling units in neighborhood establishments, and applied their efforts to promoting sale of these units with the result that they led their territory in the number of such installations. How this was accomplished makes an interesting story, and one which other dealers may read with profit.

"When we had been approached with these units and they had been effectively demonstrated, we saw in them an opportunity for installing them in places that could not afford the conventional type air conditioning installations," A. F. Beyer stated, in discussing their experiences. "We went after the business when everybody was talking about air conditioning. We applied our merchandising efforts to these units, and we met with some success."

The type of unit referred to by Mr. Beyer, known as an evaporative cooler, does not include a complete mechanical air conditioning unit, but operates on the principal of absorption of heat by evaporation of water. Cooling is produced by drawing large volumes of air over moist surfaces which are kept moist by continuous trickles of water. Much of the Southwest is sufficiently arid to make evaporative coolers an economical and effective means of cooling homes and small business establishments during the summer months.

"Reflecting back over our experience," continued Mr. Beyer, "there are several factors to which such success as we have enjoyed may be attributed, and which may be expressed as follows:

### Commercial Prospects Best

"First, because these units could be installed at a comparatively low cost, we saw a vast field in neighborhood cafes, grocery stores, beauty shops, barber shops, and other places where such an installation would not only provide comfort, but would prove a strong sales and advertising feature.

"Second, when we had sold a unit to a neighborhood store, we went back a week or so later and thoroughly canvassed other business places in that neighborhood, with the result that we got some good business.

"Third, we capitalized on the fact that an intense interest had been built up with respect to air conditioning. Many of the hotels, office buildings, theaters, and large stores had installed air conditioning, and were featuring this fact in their advertising. People had gone into these places and had noted the marked difference from the outside heat. Consequently, much was being said about the improvement, and we used this to advantage in our sales canvasses.

"Another feature that worked to our advantage was the fact that our units could be installed at a comparatively low cost, and that the benefits of air conditioning could thus be enjoyed in these small, neighborhood places without an extensive layout of capital.

"When we had selected the make of unit we intended to merchandise, we called our salesmen together and thoroughly trained them on its features, its operation, its low cost of installation, and any other advantages that would help in the sale. Then we started out after the business.

"We first called on those neighborhood places which were in the best position to make such an installation—those that had a little better front than the average, that were doing a good business, and which would be most susceptible to our sales arguments.

"As an illustration, we installed a unit in an eating place where foods and drinks were served, where there was an electric phonograph for those who cared to dance, and where many people dropped in during the evening for a bottle of beer and a sandwich, and to dance.

"Installation in such a place brought this unit to the attention of scores of people in that neighborhood. Men and women came there for a cold drink, noticed the greater comfort experienced through a cooler place, and passed the word around. The housewife told her grocer and the operator of a neighborhood beauty shop. The man told his barber. Within a few days it had gone around the neighborhood that this was an ideal place to go in the evening, and business here picked up.

"Then we came back with our

follow-up campaign. We called on other places in the neighborhood selling food and drinks, and it was not much trouble to sell them. We brought the value of air conditioning home to the woman who operated a beauty shop, and we kept after her until we had installed one of these units in her shop. Then, when the women who patronized this shop told how much more comfortable it was there, it was not much trouble to talk business with other shops.

"A letter we received from a woman who operates a neighborhood grocery store in which we made an installation, best illustrates the effects of such an improvement. This woman wrote us that women in the neighborhood came in during the afternoon and stayed longer because it was more comfortable, and in staying longer they saw more things they needed, bought more, and the business was aided accordingly.

"The same practice that applied to the beauty shops, also applied to the neighborhood barber shops. We would go into a shop that was a little above the average, for we know that the man who operated such a shop would be interested in anything that would make his shop better, and we experienced little difficulty in selling him on the value of air conditioning. Then, when we had installed one of our units, and men began to flock to his place on Saturdays and his business increased accordingly, the matter of going to the other shops in the neighborhood and selling them a similar installation was made much easier.

"It was this getting in on the ground floor while air conditioning was still new, while it was in the news, and cashing in on it, together with the follow-up after we had installed a unit in a neighborhood, that we attribute such success as we have enjoyed."

# "BE A HOT AIR ARTIST"

## *And turn to your advantage the full season ahead for fan sales promotion*

**By C. M. Kilian**

NOW please don't interpret that to mean that I'm recommending to you that you become an expert shooter of the bull, a blowhard, a boaster or exaggerator of the truth. It is hoped that you will take the recommendation literally—really become a hot air artist—you know, a fellow who can do things with hot air, especially during the summer which is ahead of us. You may not be thinking much about hot weather now. The nights are still cool—maybe even a bit nippy—and blankets are still in order. But tain't gonna be that way long. Some scorchers are on the way a couple of months hence, and then where are you going to be?

Will you be on the job and ready—as a hot air artist? Will you be all set to tell your sweltering customers that they can rely on you to install for them a ventilating fan of the right capacity to give them those gentle cooling breezes on those hot summer nights? Or are you going to take a chance—and be a bull artist—and sell them fan installations that may have the velocity of a tornado and just about blow them out of their beds? Or one so gentle and weak in its operation that they cant tell there's a breeze at all and will therefore conclude that you gypped 'em? But maybe you're going to be a hot-air artist—a fellow who knows his stuff—who knows what capacity fan is needed to do a complete comfort cooling job for any type of residence, *and* who has let his customers know well in advance of fan season that he's ready for all comers with one of the best makes of attic ventilating or other type fans for summer comfort.

If the latter, you'll start *now* getting up your mailing list. You'll finish it soon, and by the middle of April will start sending out at 10-day or two-week intervals literature on attic fans with which the manufacturer you deal with will supply you. About the middle of May (or sooner) you'll start using the telephone, calling up the whole list a couple of days after you've mailed the folder, and try to persuade them to ask you to come out to measure up the house—"just to see how big a fan would be needed in case you decide you want one later."

Beginning about the first of May, you'll have an advertisement in your local newspaper once a week, reminding the people in your community of the fact that your's is the firm that can give them that relief from hot air that they want, and that now is the time to talk about it, instead of waiting until hot weather gets here, when everybody will be wanting installations all at the same time, and when rush jobs will have to be done.

A couple of advertisements of the kind you may want to run appear on this page. No doubt the manufacturer whose fan you sell will be able to supply you with appropriate illustrations.

Almost everybody now knows someone who has an attic fan for summer comfort cooling, and has heard the favorable comment about them. This year ought to be a good time for you to begin cashing in on this additional item of equipment for the live electrical merchant to be selling.

**HERE ARE SOME CUSSWORDS FOR YOU TO USE WHEN SUMMER COMES "?—X!!()YZ"**

When summer comes and the days and nights get hot, maybe you'll want to do some cussing. These are some good—or shall we say bad—words for you to use when you want to cuss yourself for not putting in an attic ventilating fan for summer comfort cooling.

Now is a good time to let us measure up your house to see what size fan you need. It's also a good time to make an installation—**before** the hot weather gets here and the rush season begins.

**BLANK ELECTRIC COMPANY**
**All Kinds of Electrical Equipment and Wiring**

**MAYBE YOU'RE NOT CUSSIN' HOT WEATHER NOW**

But hot weather's on the way, and some of those breezeless days and nights that you can expect may make you want to cuss even though you're not that kind of a person.

**WHY NOT LET US MEASURE YOUR HOUSE NOW?**

Then a little later (or now) if you want us to install one of those comfort cooling fans, we'll have all the dope and can do the job in short order. Right now, before the rush season, is a good time to make an installation, even if you won't need the comfort until later.

**BLANK ELECTRIC COMPANY**
**Electric Ranges, Water Heaters, Washing Machines, Refrigerators, Lamps, Wiring, Fixtures**

# WHAT WIRE SHALL WE USE?

***Type R, RP or RH? There are many factors to be taken into consideration in each specific installation but the discussion presented here with comparative cost data on an ampere-foot basis greatly simplifies the problem.***

MANY problems will arise in the application of the current-carrying capacity tables of the 1940 National Electrical Code, and most of these problems will have to be first worked out by engineers and contractors in the selection of the type of wire to be used in specific installations.

There has also of late been some discussion on the advisability of using smaller conductors in parallel rather than one large conductor for feeders and mains. Both of these problems will be discussed in this article.

Table 1 shows the cost per 100-ampere feet for various sizes of conductors and for insulations of Types R, RP, and RH. The values given are for 3-wire mains with three conductors in a conduit and the conductors loaded to their rated capacity. Costs shown are in dollars and cents carried to three decimal points, and include the cost of conduit, fittings, and installation, and the cost of conductors and their installation. Costs have been supplied by the Electrical Contractors' Association of Chicago and are based on a labor charge of $1.50 an hour, with conduit and wire at average costs, and while these costs will be found to vary in different parts of the country, and will vary according to the amount of wire and conduit purchased at one time, they are intended only for comparison purposes and will be found approximately correct when used for this purpose.

Several conditions will be illustrated by the information contained in Table 1, but this table may be used to make comparisons other than those which follow.

Table 2 contains some of the information shown in Table 1, but in addition shows the carrying capacities of the conductors. A study of Table 2 is enlightening. For instance, it indicates that the cost per ampere-foot for Type RP wires is less than Type R wires for all values shown. It also shows that the cost per ampere-foot for Type RH wires is lower than for either Type R or Type RP wires for all sizes shown.

**This discussion is reprinted by permission from the I.A.E.I. News-Bulletin for January, 1941, and is typical of the practical information provided members of the International Association of Electrical Inspectors. Contrary to what many believe, membership in this Association is open to anyone interested in the development and standardization of the electrical industry. Those not actively engaged in the inspection of electrical installations may become associate members. For further information, write to Joseph Whitner, Secretary, Southern Section, I.A.E.I., P.O. Box 1743, Atlanta.**

●

The cost per ampere-foot as shown in Table 2 is on the basis of the conductor being fully loaded to its maximum allowable carrying capacity. It is not always practical to load a conductor to its maximum allowable load, and so Table 3 has been compiled to show the cost for various loads.

Frequently, in selecting the size of conductor for a given load, a conductor with considerable excess capacity must be selected. This is illustrated in the case of the 70-ampere load in Table 3. For Type RH a No. 4 wire must be used (see Table 2), and No. 4 Type RH has a current-carrying capacity of 86 amperes. The cost per ampere for a 70-ampere load will, therefore, be high for this type of insulation. On the other hand No. 4 in Type RP wire has a carrying capacity of 72 amperes so that the cost per ampere will be low. Another illustration occurs in the 90-ampere load. For Type RH a No. 2 conductor must be selected, and a No. 2 has a carrying capacity of 115 amperes. Here again, the cost per ampere will be high whereas it will be comparatively low for Type RP which has a carrying capacity of 96 amperes.

## TABLE 1

**Comparative Costs—Per 100 Ampere-Feet**
Types R, RP, and RH Conductors
Maximum NEC Load
3-Wire Mains
3 Conductors per Circuit

| | | | Type R | | Type RP | | Type RH | |
|---|---|---|---|---|---|---|---|---|
| Wire Size AWG or MCM | Cond. Size | Cost Cond. per 100 ft. | Cost Wire per 100 ft. | Cost Cond. and Wire per 100 amp.-ft. | Cost Wire per 100 ft. | Cost Cond. and Wire per 100 amp.-ft. | Cost Wire per 100 ft. | Cost Cond. and Wire per 100 amp.-ft. |
| 6 | 1¼ | 33.76 | 16.05 | 1.110 | 19.28 | 0.980 | 20.32 | 0.832 |
| 4 | 1¼ | 33.76 | 21.13 | 0.915 | 25.10 | 0.810 | 27.66 | 0.714 |
| 2 | 1½ | 41.29 | 28.10 | 0.867 | 32.26 | 0.770 | 35.66 | 0.670 |
| 1 | 1½ | 41.29 | 37.61 | 0.867 | 43.37 | 0.770 | 46.59 | 0.670 |
| 0 | 2 | 55.52 | 45.26 | 0.960 | 53.22 | 0.860 | 59.45 | 0.770 |
| 00 | 2 | 55.52 | 53.65 | 0.910 | 61.50 | 0.810 | 66.50 | 0.705 |
| 000 | 2 | 55.52 | 62.73 | 0.860 | 73.45 | 0.780 | 77.21 | 0.670 |
| 0000 | 2½ | 80.35 | 74.26 | 0.970 | 86.90 | 0.870 | 89.96 | 0.740 |
| 300 | 3 | 103.48 | 101.63 | 1.030 | 120.50 | 0.980 | 128.46 | 0.810 |
| 400 | 3 | 103.48 | 125.83 | 0.980 | 146.65 | 0.890 | 156.13 | 0.770 |
| 500 | 3 | 103.48 | 154.13 | 0.970 | 177.57 | 0.880 | 189.62 | 0.770 |
| 600 | 3½ | 131.84 | 191.06 | 1.120 | 223.70 | 1.000 | 234.41 | 0.870 |
| 750 | 3½ | 131.84 | 227.24 | 1.080 | 262.94 | 0.990 | 275.69 | 0.860 |
| 1000 | 4 | 162.48 | 292.69 | 1.220 | 339.91 | 1.104 | 357.47 | 0.960 |
| 1250 | 4½ | 202.22 | 369.18 | 1.390 | 428.34 | 1.280 | 448.74 | 1.110 |
| 1500 | 5 | 255.49 | 426.24 | 1.570 | 505.80 | 1.460 | 529.97 | 1.250 |
| 2000 | 6 | 351.00 | 569.90 | 1.970 | 662.76 | 1.820 | 695.40 | 1.570 |

An examination of Table 3 will show that for other than the 70-ampere and the 90-ampere loads referred to above, the cost per ampere for Type RH wires is lower than for either Type R or Type RP wires. The cost per ampere-foot for Type RP wire is lower than for Type R wire for most of the loads listed.

### Multiple Circuits

There is a strong tendency at the present time to use comparatively small conductors for mains, either singly or in multiple. An analysis of the wiring table will indicate one of the reasons for this tendency.

Table 4 shows the circular mils per ampere for the various sizes of conductors, and the conductors of several types of insulation. A No. 14 wire has an area of 4,107 circular mils and for Type R has an allowable carrying capacity of 15 amperes or 273 circular mils per ampere.

Note from Table 4 the circular mils per ampere for Type R wires. A 2,000,000 c.m. cable has 4,319 circular mils for each ampere which it is allowed to carry. Compare this with No. 14 where 4,107 circular mils can carry 15 amperes. In other words there is over fifteen times as many circular mils of copper per ampere for a 2,000,000 c.m. cable as for a No. 14 wire.

The reason for this can be readily seen. The operating temperature of a wire depends to a certain extent on the radiating surface provided by the exposed area of the wire. A No. 14 wire one inch long has .628 square inches of exposed surface. A 2,000,000 c.m. cable one inch long has 6.28 square inches of exposed surface, or ten times as much as a No. 14, yet it has 486 times as many circular mils of copper.

Another factor affecting the use of conductors of large capacity is the skin effect where alternating current is used. In large conductors there is a tendency for an alternating current to avoid the conductors in the center of a cable and for a greater proportion of the current to flow over the outer layers of conductors. This effect is noticeable in conductors of large capacity. Skin effect is an important factor in the voltage drop of a circuit.

It is evident that the larger size conductors cannot be as economical as those of smaller size.

Table 5 shows a comparison between one set of conductors in a conduit for various loads, and the same load carried on two sets of conductors of smaller size in multiple. In Type R wire, it will be found that for all loads from 150 amperes up, the cost per ampere is less for two wires in parallel than for a single wire.

The same will be found true for Type RP and Type RH wire for loads of 200 amperes and larger.

For any given load from 200 amperes up, the cost per ampere for two Type RH wires in parallel is less than the cost per ampere for any other combination.

The cost per ampere foot is not necessarily the deciding factor in placing conductors in multiple and there are other important factors that must be given consideration. Section 3008 of the 1940 National Electrical Code states that, "Conductors may be placed in multiple only by *special permission*, except as permitted in sections 3052 and 6205."

### Special Considerations

There are several reasons why conductors in multiple are objectionable. According to the law of divided circuits, where two conductors are placed in multiple, current will divide over the two paths in inverse proportion to their resistances. Any variation in the resistance of one conductor from the other will tend to an unequal division of the current. Such resistance might be caused by one conductor (even if of the same circular millage) being longer than the other; by a resistance at the point where the conductors are connected together; or by a greater impedance in one leg of a circuit than in the other.

It is difficult to provide proper overcurrent protection for conductors in multiple. If a fuse is placed in each conductor, one fuse may blow and the remaining conductor will carry the full load. Fuses, fuseholders, circuit breakers, all present opportunities for additional and variable resistances in the circuit.

It is sometimes possible to avoid the use of conductors in multiple by providing for several circuits of less capacity, each such circuit feeding a portion of the

## TABLE 3

**Comparative Costs—Per 100 Ampere-Feet**

Types R, RP and RH
for Various Loads
3-Wire Mains
3 Conductors per Circuit

| Load in Amperes | Cost per 100 Ampere-Feet | | | Lowest Cost |
|---|---|---|---|---|
| | Type R | Type RP | Type RH | |
| 60 | .915 | .980 | .901 | RH |
| 70 | .991 | .841 | .877 | RP |
| 80 | .867 | .920 | .767 | RH |
| 90 | .876 | .817 | .855 | RP |
| 100 | 1.008 | .847 | .770 | RH |
| 125 | .946 | .869 | .703 | RH |
| 150 | 1.030 | .860 | .766 | RH |
| 175 | 1.172 | .955 | .758 | RH |
| 200 | 1.146 | 1.120 | .851 | RH |
| 225 | 1.019 | .995 | .756 | RH |
| 250 | 1.030 | 1.000 | .927 | RH |
| 275 | 1.174 | .909 | .843 | RH |
| 300 | 1.196 | .936 | .865 | RH |
| 350 | 1.300 | 1.015 | .837 | RH |
| 400 | 1.428 | 1.256 | .916 | RH |
| 450 | 2.046 | 1.116 | .905 | RH |
| 500 | ..... | 1.522 | 1.040 | RH |
| 550 | ..... | 1.843 | 1.183 | RH |
| 600 | ..... | ..... | 1.309 | RH |

## TABLE 2

**Comparative Costs—Per 100 Ampere-Feet**

Types R, RP, and RH Conductors
Maximum NEC Load
3-Wire Mains
3 Conductors per Circuit

| Wire Size AWG or MCM | Cond. Size | Type R | | Type RP | | Type RH | |
|---|---|---|---|---|---|---|---|
| | | Car. Cap. Amps. | Cost per 100 Amp.-ft. | Car. Cap. Amps. | Cost per 100 Amp.-ft. | Car. Cap. Amps. | Cost per 100 Amp.-ft. |
| 6 | 1¼ | 45 | 1.110 | 54 | .980 | 65 | .832 |
| 4 | 1¼ | 60 | .915 | 72 | .810 | 86 | .714 |
| 2 | 1½ | 80 | .867 | 96 | .770 | 115 | .670 |
| 1 | 1½ | 91 | .867 | 110 | .770 | 131 | .670 |
| 0 | 2 | 105 | .960 | 127 | .860 | 151 | .770 |
| 00 | 2 | 120 | .910 | 145 | .810 | 173 | .705 |
| 000 | 2 | 138 | .860 | 166 | .780 | 199 | .670 |
| 0000 | 2½ | 160 | .970 | 193 | .870 | 230 | .740 |
| 300 | 3 | 198 | 1.030 | 238 | .980 | 285 | .810 |
| 400 | 3 | 233 | .980 | 281 | .890 | 336 | .770 |
| 500 | 3 | 265 | .970 | 319 | .880 | 382 | .770 |
| 600 | 3½ | 293 | 1.120 | 353 | 1.000 | 422 | .870 |
| 750 | 3½ | 330 | 1.080 | 398 | .990 | 475 | .860 |
| 1000 | 4 | 377 | 1.220 | 455 | 1.104 | 543 | .960 |
| 1250 | 4½ | 409 | 1.390 | 493 | 1.280 | 589 | 1.110 |
| 1500 | 5 | 434 | 1.570 | 522 | 1.460 | 625 | 1.250 |
| 2000 | 6 | 463 | 1.970 | 558 | 1.820 | 666 | 1.570 |

## TABLE 4

Circular Mils per Ampere of Carrying Capacity

| Wire Size | Type R | Type RP | Type RH |
|---|---|---|---|
| 14 | 273 | 227 | 186 |
| 12 | 326 | 284 | 241 |
| 10 | 415 | 334 | 280 |
| 8 | 471 | 402 | 336 |
| 6 | 583 | 486 | 403 |
| 4 | 695 | 579 | 473 |
| 2 | 829 | 691 | 577 |
| 1 | 919 | 760 | 638 |
| 0 | 1,004 | 830 | 698 |
| 00 | 1,109 | 918 | 765 |
| 000 | 1,216 | 1,010 | 843 |
| 0000 | 1,322 | 1,096 | 920 |
| 300 | 1,515 | 1,260 | 1,052 |
| 400 | 1,716 | 1,423 | 1,190 |
| 500 | 1,887 | 1,567 | 1,308 |
| 600 | 2,047 | 1,700 | 1,421 |
| 750 | 2,270 | 1,884 | 1,579 |
| 1000 | 2,652 | 2,197 | 1,841 |
| 1250 | 3,056 | 2,535 | 2,122 |
| 1500 | 3,456 | 2,873 | 2,400 |
| 1750 | 3,886 | 3,216 | 2,690 |
| 2000 | 4,319 | 3,584 | 3,003 |

total load. However in this arrangement there is a certain loss in efficiency where the entire load is carried on one conductor.

Voltage drop is becoming of increasing importance and particularly with the increased carrying capacity permitted by the 1940 National Electrical Code for some of the new conductor insulations. To take care of voltage drop, conductors are often selected with a much greater carrying capacity than the rated load. In cases of this kind the cost per ampere-foot is of no value in selecting conductors.

## Room Conditioner for Heating or Cooling

(*Continued from page 17*)

But the real answer to the problem of spreading the usefulness of the room cooler throughout the year is the reverse-cycle model which *heats* as well as cools, and brings in *fresh tempered* air from outdoors in all seasons. In hot weather, it cools the room air and wrings out its oppressive moisture. In cool weather, it brings in fresh, filtered air from outdoors and tempers it to room temperature. It has all-season usefulness throughout the day and night hours—surely a comfort and convenience to the user and a load-builder par excellence!

A study of the official weather reports for the calendar year 1940 in various cities throughout the country reveals some interesting contrasts in the probable use of the reverse-cycle cooler in different climates. For example, in Boston, during 1940, there were at least 21 days when, by commonly accepted standards, cooling was needed for a reasonable degree of comfort. But there were 46 days during the period from May 1st to September 30th (the period during which central plant heating would not normally be in use) in which heating was needed *at noon-day!* This does not take into account all the days during the remaining seven months from October to April when the temperature was scarcely low enough for central plant heating and an auxiliary source of heat would have been most welcome. But, allowing an average of five hours use per day for cooling and three hours per day for heating, with energy consumed in either case at a rate of 950 watts, we have 99 kwh of cooling load and 131 kwh of heating load—or a total for the year of 230 kwh, more than double the load for cooling alone.

In contrast with Boston, let's see what Miami has to offer. There were 234 days in Miami in 1940 when cooling, at some time of the day, was needed—spread over every month of the year with the smallest number, 5, in the month of February. There were only 54 days in the year, spread between November and April, when the noon-day temperature indicated need of heat. Following the same formula used in the case of Boston, we find that about 1,265 kwh would have been consumed by the reverse-cycle cooler in Miami during the year 1940. The reverse-cycle room cooler challenges the electric range and water heater as a revenue producer!

It's interesting to see from the following table, the probable hours of use of the reverse-cycle cooler in different parts of the country, based on the conservative formula used in the examples above and 1340 weather:

| City | Hours of Use For Cooling | Hours of Use For Heating |
|---|---|---|
| Miami | 1,170 | 162 |
| Tampa | 875 | 165 |
| Houston | 745 | 267 |
| New Orleans | 710 | 279 |
| Dallas | 685 | 372 |
| Atlanta | 495 | 351 |
| Cincinnati | 420 | 123* |
| St. Louis | 390 | 45* |
| Baltimore | 350 | 42* |
| Detroit | 250 | 114* |
| Philadelphia | 230 | 66* |
| Chicago | 205 | 150* |
| New York | 185 | 132* |
| Boston | 105 | 138* |

* Between May 1st and September 30th **only.**

The concerted effort of the entire electrical industry — manufacturer, distributors, dealers and the power companies—can make the reverse-cycle room cooler a household necessity, a new merchandising opportunity and a load-builder that surpasses all imagination.

## TABLE 5

Comparative Costs Per 100 Ampere-Feet Single Conductors and Two Conductors in Multiple

| Load in Amps | Type R | | | | Type RP | | | | Type RH | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | One Wire | | Two Wires in Multiple | | One Wire | | Two Wires in Multiple | | One Wire | | Two Wires in Multiple | |
| | Size Wire | Cost Per 100 Amp-Feet | Size Wire | Cost Per 100 Amp-Feet | Size Wire | Cost Per 100 Amp-Feet | Size Wire | Cost Per 100 Amp-Feet | Size Wire | Cost Per 100 Amp-Feet | Size Wire | Cost Per 100 Amp-Feet |
| 100 | 0 | 1.008 | 4 | 1.098 | 1 | .847 | 6 | 1.060 | 2 | .770 | 6 | 1.082 |
| 150 | 0000 | 1.030 | 2 | .925 | 000 | .860 | 2 | .981 | 0 | .766 | 4 | .818 |
| 200 | 400 | 1.146 | 0 | 1.008 | 300 | 1.120 | 1 | .847 | 0000 | .851 | 2 | .770 |
| 250 | 500 | 1.030 | 000 | .946 | 400 | 1.000 | 0 | .869 | 300 | .927 | 1 | .702 |
| 300 | 750 | 1.196 | 0000 | 1.030 | 500 | .936 | 000 | .860 | 400 | .865 | 0 | .765 |
| 350 | 1000 | 1.300 | 300 | 1.172 | 600 | 1.015 | 0000 | .955 | 500 | .838 | 000 | .758 |
| 400 | 1250 | 1.428 | 400 | 1.146 | 1000 | 1.256 | 300 | 1.120 | 600 | .916 | 0000 | .851 |
| 450 | 2000 | 2.046 | 400 | 1.019 | 1000 | 1.116 | 300 | .995 | 750 | .905 | 0000 | .756 |
| 500 | ..... | ..... | 500 | 1.030 | 1500 | 1.522 | 400 | 1.000 | 1000 | 1.040 | 300 | .927 |
| 550 | ..... | ..... | 600 | 1.174 | 2000 | 1.843 | 400 | .909 | 1250 | 1.183 | 300 | .843 |
| 600 | ..... | ..... | 750 | 1.196 | ..... | ..... | 500 | .936 | 1500 | 1.309 | 400 | .865 |
| 650 | ..... | ..... | 750 | 1.104 | ..... | ..... | 600 | 1.093 | 2000 | 1.609 | 400 | .798 |
| 700 | ..... | ..... | 1000 | 1.300 | ..... | ..... | 600 | 1.015 | ..... | ..... | 500 | .837 |
| 750 | ..... | ..... | 1000 | 1.213 | ..... | ..... | 750 | 1.052 | ..... | ..... | 500 | .781 |
| 800 | ..... | ..... | 1250 | 1.428 | ..... | ..... | 1000 | 1.256 | ..... | ..... | 600 | .915 |
| 850 | ..... | ..... | 1500 | 1.603 | ..... | ..... | 1000 | 1.182 | ..... | ..... | 750 | .959 |
| 900 | ..... | ..... | 2000 | 2.046 | ..... | ..... | 1000 | 1.116 | ..... | ..... | 750 | .907 |
| 1000 | ..... | ..... | ..... | ..... | ..... | ..... | 1500 | 1.522 | ..... | ..... | 1000 | 1.040 |
| 1200 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1500 | 1.309 |

# Southeastern Council Proposed

***Tennessee Electrical Contractors' Association, at annual meeting in Knoxville, sees need for council of state organizations to formulate plans and establish standards.***

**By Warner Ogden**

STEPS to organize a Southeastern Electrical Contractors' Council were initiated at a conference held during the Tennessee Electrical Contractors Association annual meeting in Knoxville, March 17 and 18.

The conference was apart from the regular program, with officials of the Tennessee chapters attending, and was suggested by Dwight L. Casey, executive secretary of the North Carolina association.

The Southeastern Council would be composed of representatives from state associations and chapters in Tennessee, North Carolina, Virginia, Georgia and South Carolina. They would meet twice a year, in the spring and fall, "to formulate plans and establish uniform standards of procedure relating to the activities and aims of the respective groups, and to coordinate work so that it doesn't conflict."

Mr. Casey was accompanied to the Tennessee convention by Ralph Robinson of Robinson Electric Co., Charlotte, N. C., president of the North Carolina association, who also took part in the convention and the conference. From Knoxville, Mr. Casey went to the Virginia convention and afterwards he expected to arrange a conference in Georgia to get cooperation.

The convention in Knoxville, attended by more than 100 electrical contractors, was called one of the best ever held. It opened with a welcome by Mayor F. L. Allen, followed by response by A. J. Thompson, retiring president of the state association.

Mr. Thompson mentioned how a bill had been opposed in the Tennessee Legislature which provided certain requirements for a Master Electrician. He explained that it was the "wording" of the original bill to which electrical contractors had objected.

Reports of chapter activities were presented at the first morning session. W. F. Cale, president of the Knoxville Chapter, told of good cooperation, which has "built up dollar volume." Highlights of his report were: that the National Electrical Code had been adopted in Knoxville; inspectors were named who enforced regulations; two county inspectors were appointed, who inspect wiring for rural sections; the Power Board will not make cut-ins until a certificate of approval is given by inspectors; and that more adequate wiring has resulted.

Phillip Sweet, in reporting for the Chattanooga Chapter, said it holds luncheon meetings regularly once a week, where problems are discussed. "Relations are better than they ever have been," he said.

Albert Gross, of the Memphis Chapter, said that meetings are held once a month and there are committees to look after any complaints. The inspections department, he said, is "very capable."

**New officers of the Tennessee Electrical Contractors Assn., above from left to right, Phillip Sweet, Chattanooga, secretary, C. R. Wright, Knoxville, president shaking hands with A. J. Thompson, Memphis, retiring president. Between Mr. Wright and Mr. Thompson is Herbert Haley, Chattanooga, first vice president, and A. C. Gross, Memphis, third vice president. The Memphis delegation, at right, was largest in attendance at the association's annual meeting other than the Knoxville delegation.**

W. G. Hoffman, Tennessee Armature & Electric Co., Knoxville, one of the leaders in arranging for the Tennessee convention, is shown at left. Center is D. B. Clayton, Birmingham, Ala., regional committeeman of the National Electrical Contractors Association, and at right is Laurence W. Davis, manager of N.E.C.A.

C. R. Wright, of Wright-Casson Electric Co., Knoxville, newly elected president of the Tennessee Association, is shown at left. On his right is H. G. Street, of Memphis Electric Co., a veteran of the electrical business.

A badge of the Tennessee Electrical Contractors Association is being pinned on J. H. Dyer, of Atlanta, a representative of the National Electric Products Corp., Pittsburgh, Pa., by pretty Miss Virginia Hodges of Knoxville, who was at the registration desk. Phillip Sweet, of Chattanooga, looks on.

Dwight L. Casey, executive secretary of the North Carolina Contractors' association, at a conference of Tennessee chapter officials, explains the need for more uniformity and closer cooperation. At his suggestion, steps were taken for forming a Southeastern Council.

Jobbers now cooperate, he said. The Memphis Chapter has a committee on apprentice training and hopes to "train a better group of mechanics." Like a problem mentioned at Chattanooga, Memphis has had the problem of some men "going to defense work," but looks for that to "work out in time." Memphis is trying to get county inspectors, as Knoxville has done, he said.

Officers for the new administrative year were next elected as follows: president—C. R. Wright, Knoxville; first vice-president—Herbert Haley, Chattanooga; second vice-president—Ray Edenfield, Nashville; third vice-president—Albert Gross, Memphis, and secretary-treasurer—Phillip Sweet, Chattanooga, re-elected. W. G. Hoffman, of Knoxville, and A. J. Thompson, of Memphis, were elected to the board of directors.

At the conclusion of the first morning's session, Mr. Casey asked officials of the Tennessee Chapters and the state association to meet with him to discuss closer cooperation, a program of education, and the establishment of a Southeastern Council to work along those lines. More plans were made at another conference later in the day.

### Apprentice Training Plans Discussed

Both the business session before the luncheon, at which chapters reported and officers were elected, and the afternoon session, as well were for contractors only. Two federal labor men, J. M. Parmlee, of Little Rock, and J. Walter Stiles, of Knoxville, were introduced. Mr. Parmlee told of how a committee on apprentice training has been appointed at Memphis and he said he "would like to see a state committee setup."

Ralph Robinson next told of the North Carolina Association's work. He said that key men had conferred with wholesalers and obtained pledges of cooperation with contractors.

Executive Secretary Casey explained the organization of the North Carolina Association, with its two kinds of memberships. Some applicants for membership have had to be turned down. Only legitimate contractors who have an established place of business are accepted. They must have tools, credit, and be up to standards. He told of the service which the association gives, including that to groups over the state, and added, "We won't take money unless we can serve."

Mr. Casey praised the National Electric Code. "Don't complain about electrical inspections," he advised. "Inspectors should be your best friends. They are one of your greatest protectors."

He advocated a more uniform program in various states and mentioned that steps toward it are being taken.

During a discussion which followed, the suggestion was made that small towns be urged to organize chapters.

Some had raised the question as to the desirability of apprentice training. A. J. Thompson, Memphis, said that Memphis is "not trying to train more, but to train men properly. If there is an adequate supply, it can be stopped. I see nothing but good ahead in the plan."

Laurence W. Davis, general manager of the National Electrical Contractors Association, New York, said the national association has a committee working on apprenticeship. "It is not a haphazard thing," he commented. "It replaces older men, lost to the industry, with new and profitable men."

D. B. Clayton, of Birmingham, Ala., who is on the executive committee of the National Electrical Contractors Association, spoke as the session was thrown open to all branches of the industry. He cautioned that today's boom is "going to be a ride—we must be careful or we will end up on worse than a joy ride."

Mr. Clayton, in discussing apprentice training, said he doesn't think there is any need to worry over too many men being trained. "I think we should depend on competent men," he said.

He advocated watching the question of profits, suggesting that contractors may find overhead is more than they anticipated. "You know taxes are going up," he pointed out. "They have got to be paid. We don't know where it is going to end. You may have to consider setting up reserves in your business. Those who don't consider this in the next year or two years are going to find themselves in bad shape. Fortunately, we have a period of several years ahead in which we can make money."

Mr. Clayton praised the organization of North Carolina contractors as outstanding. He said that organized groups "have more authority, and we should organize to protect our interests." One of the advantages, he said, is "making friends among competitors." He suggested that electrical contractors "look where they are going to land when defense work is over."

Laurence W. Davis next spoke, also praising the organization in North Carolina and listing Tennessee among the eight best. He said it is "necessary for every man to study those things affecting his business," and told what the national association has done. He deplored electrical contractors who have "sold themselves out rather than stand on the principle that electrical work belongs to the electrical contractor."

Mr. Davis suggested that each chapter have a labor policy committee to meet at least once a month and discuss, in partnership fashion, problems and employment with labor.

He also discussed "destructive price campaigns, which lead nowhere." He said there is no need for "jitters" over trade association work, and that the law was "not intended to destroy the right of men to discuss these things."

Mr. Davis told of how for two days he had testified, as an expert witness, in a Pennsylvania case. He told the jury: "Overhead is what the customer wants. If a contractor didn't have the overhead, the customer would do the job himself. The contractor has the tools, credit, and men for the work. . . . Overhead and profit are different. A business must be managed. Profits don't start until management is paid for. If an electrical contractor died and his widow continued the business, then she would have to hire someone and pay for management."

### TVA Director Addresses Group

A banquet was given at night by the Knoxville Electric League. Clyde Carpenter, Jr., sales manager of the City Power Board, was toastmaster. The banquet opened with a floor show, which was followed by introduction of prominent visitors and an address by James P. Pope, former United States Senator and now a director of the Tennessee Valley Authority.

"In the Tennessee Valley area, the price for electricity was cut in two, and the consumption of electricity more than doubled," he said. "The average con-

*(Continued on page 58)*

**L. P. Self, who was chairman of the convention committee for the Tennessee Electrical Contractors Association, is pictured at right, just after he pinned on his badge. At left is W. E. Briscoe, of Briscoe Electric Co., Knoxville, whose electrically heated homes in Knoxville have attracted national interest.**

**A. J. Thompson, of Memphis, retiring president of the Tennessee association, shakes hands in the Hotel Andrew Johnson lobby, Knoxville, with V. J. Armstrong, of Electric Service Co., Knoxville.**

**Dwight L. Casey, executive secretary of the North Carolina contractors' association, is shown at left with Ralph K. Robinson, of Robinson Electric Co., Charlotte, N. C., president and long a leader in the North Carolina association. Both took a prominent part in the convention.**

**Lester F. Manning, of Manning Electric Co., Knoxville, shows his luncheon card to Miss Mamie Lee Reagan. Mr. Manning is one of the youngest electrical contractors to have his own business, but has had long experience, and was among the most active delegates.**

# Overcurrent Protection Rules Changed by 1940 Code

By B. Z. Segall
New Orleans Public Service, Inc.
New Orleans, La.

THE MOST important change in Article 240, on Overcurrent Protection, is the re-introduction of the mandatory requirements for tamper resisting plug fuses. These have been assigned a standardized type letter and in the future are to be designated as Type S fuses. The present standard fuses are no longer to be classified as standard plug fuses but will be known as the Edison base type plug fuses.

The new rule requires all plug fuse holders for 30 ampere size fuses or less to be designed for Type S fuses only. This becomes effective November 1, 1941. After this date, Edison base fuses will be recognized, only for existing installations.

The rules as set up in the 1940 Code present a peculiar situation. It will be noted that only Edison base plug fuses and not Edison base plug fuse holders are recognized by this Code. (Section 2451). Also, as pointed out above, all plug fuse holders must comply with the specifications for Type S fuses after November 1, 1941. The question naturally arises, what is approved as plug fuse holders between November, 1940, the effective date printed on the Code, and the date November 1, 1941, the deadline for the mandatory use of Type S holders? It has been suggested that the accepted practice would be to use the present type Edsion base holder with a Type S adapter. It is further pointed out that the Code permits the use of non-locking type of adapters up to the effective date of November 1, 1941. The use of non-locking adapters will, of course, permit the customer to remove the adapters with ease and thus leave the installation with the Edison base fuse holders.

The most serious aspect of these new rules for Type S fuses is the elimination of a mandatory requirement for interchangeability. At the present time there are twenty-one accredited plug fuse manufacturers, manufacturers having Underwriters' Laboratories, Inc., label service for their fuses. It is interesting to note that only eight of these manufacturers are producing any type of tamper resisting plug fuse. The Chase Shawmutt Company, General Electric Company and the Great Western Fuse Company are making the "Tamres" fuse and adapter. The "Fustat," at present, is being produced by the Bussman Mfg. Co., Jefferson Electric Co., Kirkman Engineering Co., National Electric Products Corp., and the Union Insulating Co.

It is quite possible under the present set up that some of the 13 other manufacturers may develop some other type of fuse to conform to the Type S specifications. To further aggravate the situation

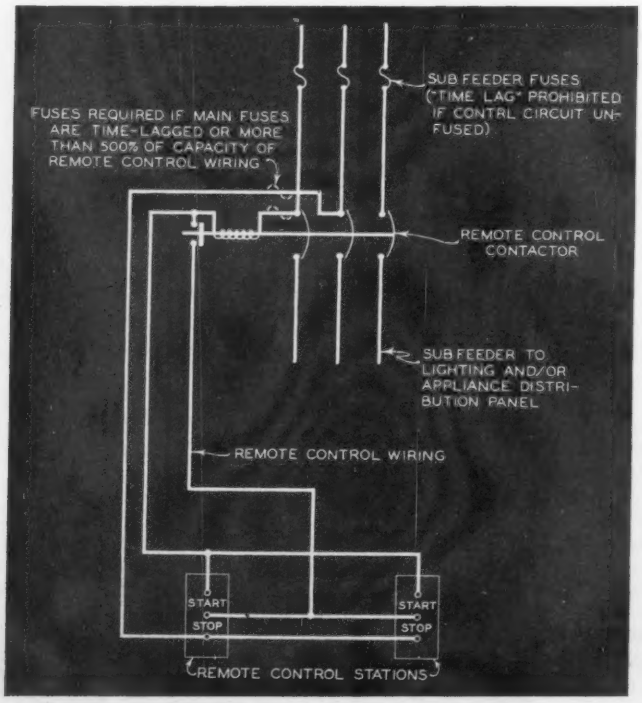
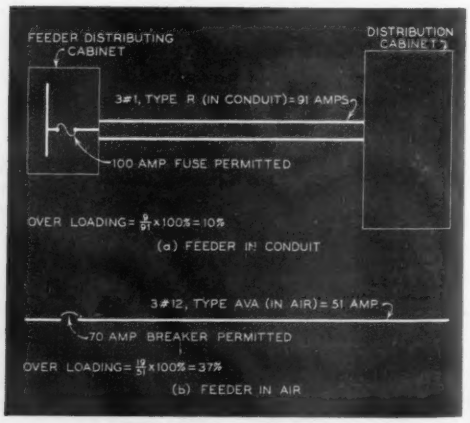

SUB FEEDER FUSES ("TIME LAG" PROHIBITED IF CONTRL CIRCUIT UNFUSED)
FUSES REQUIRED IF MAIN FUSES ARE TIME-LAGGED OR MORE THAN 500% OF CAPACITY OF REMOTE CONTROL WIRING
REMOTE CONTROL CONTACTOR
SUB FEEDER TO LIGHTING AND/OR APPLIANCE DISTRIBUTION PANEL
REMOTE CONTROL WIRING
START
STOP
START
STOP
REMOTE CONTROL STATIONS

**Fig. 47. (Below) Because many odd values of current carrying capacity listed in new Code tables do not correspond exactly to the standardized ratings of fuses and circuit breakers, a new rule has been introduced which permits an excess in fuse or circuit breaker capacity of up to 50%. Two typical examples that are now acceptable are illustrated here.**

**Fig. 48. (Left) The general requirements for overcurrent protection of remote control conductors have been made somewhat more stringent. This diagram illustrates some of the principal requirements.**


FEEDER DISTRIBUTING CABINET
DISTRIBUTION CABINET
3#1, TYPE R (IN CONDUIT)=91 AMPS
100 AMP. FUSE PERMITTED
OVER LOADING= 9/91 X100%=10%
(a) FEEDER IN CONDUIT
3#12, TYPE AVA (IN AIR)=51 AMP.
70 AMP. BREAKER PERMITTED
OVER LOADING= 19/51 X100%=37%
(b) FEEDER IN AIR

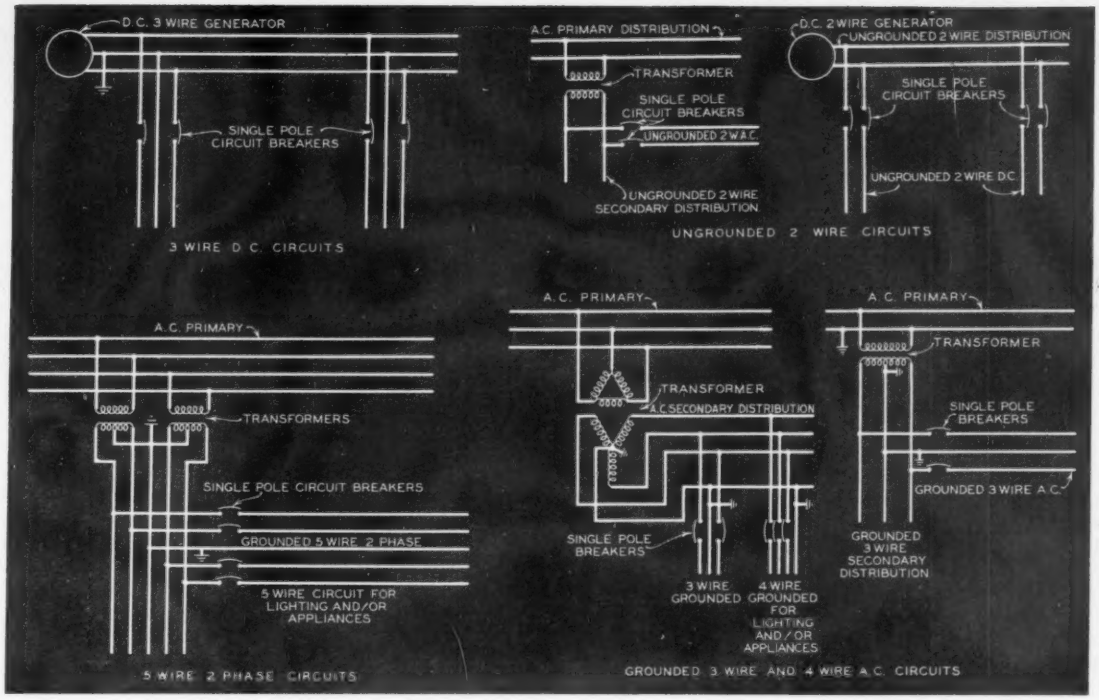



**Fig. 49. The rules relating to the use of individual single pole circuit breakers has been broadened in the 1940 Code so as to permit the use of these breakers on lighting and/or appliance branch circuits connected to four-wire, three-phase systems or five-wire, two-phase systems. These systems, however, must include a grounded conductor. The extended scope of this rule is but a logical recognition of the similarity of these polyphase lighting and/or appliance branch circuits to the two-wire and three-wire single-phase a-c or d-c circuits formerly covered by the rule.**

there is the ever present menace of the "wild cat" fuse manufacturer and his usual willingness to develop schemes whereby he can cash in on any non-standardized market. The situation is very dangerous and forebodes no good to a branch of the electrical industry which has been most successfully standardized and regulated.

The new wiring tables No. 1 and No. 2 show odd values for current carrying capacity. Many of these do not correspond to the standardized ratings of fuses and circuit breakers. A new rule has been introduced in the Code (Section 2403a) which will permit overcurrent protection in excess of the current carrying capacity as shown by the tables, provided the rating of the fuse or circuit breaker does not exceed the current carrying capacity by 50%. Figure 47a illustrates this rule for three No. 1 Type R conductors in conduit, and Figure 47b shows a similar example for three No. 12 Type AVA wires mounted on insulators in air.

The general requirements for overcurrent protection of remote control conductors have been made somewhat more stringent. The new rules still permit the use of overcurrent devices rated or set at 500%, or less, of the current carrying capacity of the remote control conductors. However, it prohibits the use of time lag fuses for such protection. The corresponding rule for the protection of the remote control wiring associated with motors (Section 4372a) does not have such a restriction. It is, therefore, to be assumed that time lag fuses cannot be used where remote control circuits for feeder switches are to be unfused in compliance with the 500% rule stated in Section 2403e. (See Figure 48.)

●

**During the past year or more, Mr. Segall has discussed the 1937 edition of the National Electrical Code up to and including Article 240 on Overcurrent Protection. With the approval of the 1940 edition of the Code, the last few articles of this series have discussed the changes in the 1940 Code from the previous edition. With this article, the series has been brought up to date and the discussion in following issues will be based on the 1940 Code itself. Comment or questions from readers are invited.**

In previous editions of the Code individual single-pole circuit breakers were permitted for the protection of each ungrounded conductor of 2-wire circuits or 3-wire single phase or d-c circuits. This rule has now been broadened to include all lighting and/or appliance branch circuits connected to four-wire, three-phase systems or to five-wire, two-phase systems. (See Figure 49.) These latter systems must, however, include a grounded conductor. The extended scope of this rule is but a logical recognition of the similarity of these polyphase lighting and/or appliance branch circuits to the two formerly recognized systems.

A new section deals with the fusing of grounded conductors of unpolarized installations. This new rule requires fuses in both conductors of new circuits added to existing unpolarized installations. Single pole fusing of the additions (i.e., solid neutral system) will only be permitted if the entire wiring system has been properly polarized by having all screw shells of lampholders connected to the grounded conductor.

*(Continued on page 63)*

# Twenty-Third Annual Meeting of Oklahoma Association

THE CLOSE relationship and community of interests between gas and electric utilities, although competitors in some fields, was clearly indicated in several talks and papers delivered before the twenty-third annual convention of the Oklahoma Utilities Association, at Tulsa, Okla., March 17 and 18. More than 400 executives and employees of gas and electric public utilities, operating in Oklahoma and adjoining states, attended the general sessions.

The electric, gas and oil industries purchase and utilize each others products as shown in statistics quoted by C. M. Ripley, of the General Electric Company, Schenectady, N. Y. The amount of electricity generated by gas and oil fuel, during 1940, was 20 billion kilowatt-hours. This was greater than the total consumption of electricity by the whole U. S. A., in 1922.

Mr. Ripley also said that within the past seven years, oil purchased by the power and light companies, jumped from seven million barrels to 17 million barrels a year. Annual purchases of natural gas by power and light companies during the same period have jumped from 107 to 191 billion cubic feet.

"Electrical power produced by oil and gas during 1940 was five times as much as would run all the trolley cars and trolley buses in the country," Mr. Ripley continued. "Nine times enough to light America's streets; ten times enough to supply all power used last year by electrified steam railroads for passenger and freight traffic; ten times more than was used by all farms of the country, and almost enough to supply the electrical needs of all the hotels, office buildings, stores, churches, theatres, grocers, butchers' shops, and department stores in the country." He emphasized the fact that the "oil, gas and electrical industries have a mutuality of interests and what helps one helps the other."

Displaying pictures and charts which illustrated a day's muscle work expressed in electrical terms, Mr. Ripley asserted that a day of hard labor is always less work than one kilowatt-hour. A chart bore pictures showing men engaged at such tasks as pumping water, lifting packages, hammering nails, operating a heavily loaded wheelbarrow, and shoveling loose dirt. A day's work at these man-power operations averaged from 110 watts, or only one-ninth of a kilowatt-hour, to 450 watts, about one-half of a kilowatt hour.

### Energy Comparison Made

"One kilowatt-hour is equal to the muscle work of a man pumping water two days, lifting weights for about five days, hammering for about six days, carrying a hod for about seven days, wheeling bricks for about eight days, or shoveling for about nine days," Mr. Ripley summarized.

"It costs less to live better, is the paradox of modern housekeeping with good engineering, and it breeds customer good will," the speaker asserted. He displayed charts showing descending costs per kilowatt-hour of electricity and consequent savings, as larger quantities of electric current are used.

One chart showed how a family of three in a six-room house saved $500 a year with electric kitchen, laundry, and automatic furnace. For families who take advantage of the electric bargains, by larger use, the dreaded drudgery is shifted from the home to the power house where it belongs, and in addition to money saving, appliance sales are boosted and factory payrolls increased.

In a paper dealing with "Practical and Technical Applications of New Wrinkles in the Heating Field," O. A. Kinzer, utilization engineer, The Dallas Gas Co., Dallas, Texas, employed "degree day records" taken in the Dallas area to disprove the old saying that southern winters are short and that not much heating is required. There are 157 days of each year in which heating is needed, according to these records. Mr. Kinzer's paper dealt with new and better applications of house heating with gas.

In a talk which applied alike to electric and gas utilities, Paul Pinson, attorney for the Oklahoma Natural Gas Co., at Tulsa, advised how such companies can "stay out of court" in many situations.

"Litigation, like death, loves a shining mark and it would seem that it is always open season for corporations, particularly for utilities," Mr. Pinson said. "Gas and electric utilities dispense products with dangerous potentialities but if several general rules are observed and good judgment exercised, many accidents can be avoided, or, if they occur, can be settled out of court."

These rules should include care in selection of personnel, which now is done by utility management, conducting of safety campaigns and instructing employees on how to minimize litigation hazards when performing service duties. Careful and competent investigations should be made of all claims presented. All possibilities of settling out of court should be weighed with a willingness to give and take. Employees should not permit their desires to give satisfactory service to lead them into performance of gratuitous services which might make their company liable in case of accident.

### Federal Powers Abused

Electric and gas utilities are very much in the same boat in the matter of their relations to federal government boards, commissions and agencies. This was brought out with emphasis in a paper by P. McDonald Biddison, consulting engineer, Dallas. He referred to the great expansion of federal government since he first saw Washington in 1898. Starting with regulation of the railroads, the government has multiplied agencies, boards, and commissions which regulate, and sometimes attempt management control of utilities.

The speaker disclaimed intent to be critical of regulatory boards but stated that his remarks were

directed to the employment of power not conferred and to the abuse of power. Utilities are natural monopolies and require such control as will prevent abuses possible from a monopoly, he asserted.

"But much of the restriction placed upon utility businesses under the guise of regulating them, and which hamper and impede the conduct of such business, is not regulation, but substitution of management and direction of them," the speaker said. "If it continues to expand, it will leave utilities in general as impoverished, impotent and obsolescent as the railroads became for the same reason, following the first World War."

### Better Relations Urged

Richard Lloyd Jones, Jr., vice-president and business manager of the *Tulsa Tribune*, told the gas and electric delegates that no one can think of a single way to improve the products of the public utilities. All are sold on these products but the utilities have the task of selling themselves.

"You, from lineman to president, must re-enthuse yourselves and talk more about your business. The utilities have been too much on the defensive, but the days of holding company abuses, practiced by a few, are over. The financing situation has been improved and now they have a real reason to talk to the people," Mr. Jones told the convention. "Once in awhile put a microphone in one of your generating plants and woo the people from there, instead of from your company offices," he suggested. "The people like to be wooed and taken into your confidence and they should know your story."

There is a tendency in Oklahoma for business men to go to sleep on their opprotunities depending on the defense program to restore prosperous conditions, declared Judge Oras A. Shaw, of Tulsa, who spoke on the subject, "Chemurgy." He was a member of a committee of business and professional leaders of Oklahoma who toured the South last year and investigated industrial conditions.

Judge Shaw said that new wealth created from production of oil, gas, the farms and industries of the state, had declined 50 per cent in Oklahoma within the past 12 years.

"Unless we re-create the pioneering spirit, which built cities and towns and developed the soil, the mines and industries of Oklahoma, we are sunk," said Judge Shaw. "Present efforts to restore eroded and worn out soil must be intensified and every one must cooperate to industrialize the state."

"Application of the science of chemurgy, which includes making non-edible materials and articles from products of the soil, will not alone solve these problems, but will help materially. It can create new markets for farm products, bring processing plants to communities where these are raised, and furnish new income and employment for many in Oklahoma."

Judge Shaw enumerated some of the wonders being performed by chemurgists. Corn is being processed into 150 non-edible products, peanuts into 300, sweet potatoes are being converted into fine starch and cellophane, and castor beans and alfalfa, which grow profusely in Oklahoma, can be converted into medicines and meal.

"There is an old saying that you cannot make a silk purse out of a sow's ear, but chemurgists are making ladies' purses which look very much like silk, out of such ears," continued Judge Shaw. "Chemurgy has succeeded in making an anti-freeze from potato culls which can be sold for 10 cents a gallon. Timber waste is being utilized in the South in making a fine grade of newsprint."

Some of the utility people pointed out that application of chemurgy on an extended scale will materially increase the loads and revenues of electric and gas utilities, because utilization of heat and power are necessary in operating processing and manufacturing plants. Leaders in the industry in Oklahoma, for the past year, have been showing a vital interest in the subject.

An exhibit of a small scale model of a 66,000-volt substation under construction by the Central States Power and Light Corp., of West Union, Iowa, was a center of attraction in the lobby on the convention floor. The model was designed by O. N. Bernabe and A. A. Phillips, engineers for the Central States corporation at Tulsa.

The model represents a progressive engineering idea, Mr. Bernabe explained. Such models, supplementing blueprints, will aid construction men by giving them a better conception of the spacing and clearances in the structure.

At the annual banquet, held on Monday night in the Crystal Ball Room, Mayo Hotel, and attended by 460 utility people and their guests, Dr. A. Linscheid, for the past 21 years president of the East Central State College, at Ada, Okla., delivered a patriotic address on the subject, "The Ramparts We Watch." These ramparts include not only thorough preparation in armies, guns and other equipment, but in the maintenance of high morale of our people, he pointed out.

Judge Reford Bond, chairman of the Oklahoma Corporation Commission, in a brief talk at the banquet, deplored the growing tendency of federal authorities to extend regulation to intrastate public utilities. Such utilities, especially in connection with their rates and operating practices, should remain under the jurisdiction of the state regulatory boards and commissions, he said.

W. L. Woodward, president, Zenith Gas System, Inc., Alva, Okla., was convention committee chairman, also toastmaster, at the banquet. In the absence of R. K. Lane, president, Public Service Company of Oklahoma, and president of the association, who was in the East on business, Mr. Woodward presided over the convention sessions in his capacity of first vice-president. He was assisted by J. C. Happenny, association second vice-president.

### Division Heads Selected

Before the general convention sessions opened Monday morning, short sessions of the electric and gas divisions of the Oklahoma Utilities Association were held. The Gas Division elected E. C. Joullian, president, Consolidated Gas Utilities Corp., of Oklahoma City, as chairman to succeed A. F. Potter, manager at Bartlesville, Okla., of the Gas Service Co. The Electric Division re-elected J. C. Happenny as its chairman. Each division plans mid-year meetings to discuss more detailed problems.

Aside from division officers, no officers were elected at the convention. These were chosen to serve for 1941 at a meeting of the board of directors in Tulsa, last December. These include: R. K. Lane, Tulsa, president; W. L. Woodward, Alva, first vice-president; J. C. Happenny, Sand Springs, second vice-president; B. M. Lester, Oklahoma City, treasurer, and Miss Kate A. Niblack, Oklahoma City, secretary.

# HOTPOINT PRESENTS SALE

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LIFE MAGA

COMMEMORATING THE

*One Millionth*

## Hotpoint Electric Range

THE ARISTOCRAT, Hotpoint's Millionth El

## A Million Homes Have Found A Bett

IT may come as real news that a single manufacturer has produced One Million Electric Ranges. Certainly it will surprise those who still consider the electric range a luxury.

BUT Hotpoint's million electric ranges were not purchased as luxury items. They were the choice of money-smart women who sought a *cleaner, better, easier way to cook.*

IT is gratifying to have pioneered this essential improvement in the living standards of a nation. We thank the million women who believe with us that electricity is the truly clean and modern m for cooking as well as lighting.

TODAY'S Hotpoint Electric Ranges set a new standard of convenience and dependability starts to cook in less than half a minute. Calrod Hi units provide five measured heats to suit ever of cooking. Such features as all-porcelain e finish, flavor-seal oven and thrift cooker may in models that sell as low as $89.95 at the fac

AS Hotpoint begins production on its *second million* electric ranges we are able, because of the

### *Thoughts at a Glance*

**Hotpoint has *made* and *sold* its *first million electric ranges.* This millionth Hotpoint range is set apart for a nation-wide celebration in which the industry and public will take part.**

**Salesmen, retailers, distributors, manufacturers — all of us have had our share in this achievement. It is more than a manufacturing accomplishment. It is a testimonial to the astute merchandisers who, with us, pioneered electric cooking against ingrained habits and prejudices with competition all the way.**

**We also like to consider this success as a tribute to Hotpoint quality. Each of these million ranges has contributed to the reputation of Hotpoint research, engineering and manufacturing.**

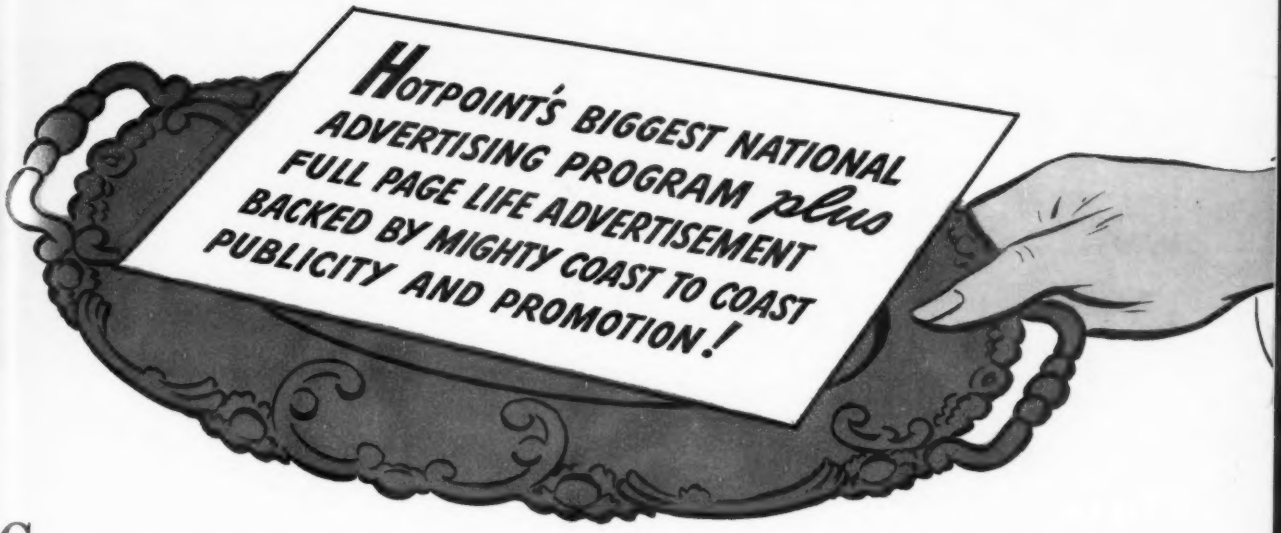
**Of course, we are proud of this achievement. But now, like all progress, it becomes history. It is simply a guide for the future.**

**Today, we are on our *second million* . . . looking toward new horizons, greater triumphs — a vaster future for "The Name Everybody Knows."**

*Vice-President*

ELECTRIC Hotpoint R

# ...ON A GOLDEN PLATTER • • •


HOTPOINT'S BIGGEST NATIONAL ADVERTISING PROGRAM plus FULL PAGE LIFE ADVERTISEMENT BACKED BY MIGHTY COAST TO COAST PUBLICITY AND PROMOTION!

CAN you think of a better way to celebrate the building and selling of *one million* Hotpoint Electric Ranges than by announcing a new nation-wide sales campaign that will launch dealers well on their way to a *second million?*

That's Hotpoint's way of saying "thanks a million" to its dealers, as well as to enthusiastic Mr. and Mrs. America, who have given Hotpoint Electric Ranges the tremendous prestige of this *proved* performance record in a million American homes.

See the important golden announcement which appears in the April 28th issue of LIFE. This regal, eye-catching advertisement not only commemorates a mighty milestone in Hotpoint history —it opens a magnificent new spring sales campaign that will bring greater profit opportunities to Hotpoint dealers everywhere.

Millions of people read about your product in the parlor. The way is paved for you to get into their kitchens with more sales of new Hotpoint Electric Ranges. Tie up your sales program with this mighty nation-wide promotion. See your Hotpoint distributor at once. Edison General Electric Appliance Co., Inc., 5614 West Taylor St., Chicago, Ill.

*All Hotpoint Electric Range models will share the spotlight in this great new spring campaign. Plan a complete display of Hotpoint Ranges featuring the Aristocrat with Golden nameplate.*

**OWERFUL *One Millionth* RANGE SALES PROMOTION PACKAGE DEAL TO BOOST YOUR SALES**

**ELECTRIC Hotpoint RANGES**

ORS • WATER HEATERS • CLOTHES DRYERS • WASHERS AND IRONERS • AUTOMATIC DISHWASHERS • ELECTRASINK • STEEL KITCHEN CABINET

# Distribution Problems Featured In Engineering Conference

OPERATING problems, distribution system economies, and personnel difficulties resulting from the national defense program were among the topics that occupied nearly 150 utility engineers in attendance at the spring meeting of the Engineering and Operation Section of the Southeastern Electric Exchange, in Savannah, Ga., March 13 and 14.

Following opening remarks by Chairman Lewis Payne, president, Eastern Shore Public Service Co., and an address of welcome by C. C. Curtis, president, Savannah Electric and Power Co., the technical program was opened by George S. Humphrey, vice president, Pontomac Edison Co., with a comprehensive discussion of "Practical Distribution Economies."

### Distribution Economies

Under three main divisions, organization and personnel, design and construction, operation and maintenance, Mr. Humphrey outlined the practices of his company which had required during the past five years only a 7 per cent increase in the line force despite an increase of 20 per cent in the number of customers served, an increase of 25 per cent in the number of poles, and a reduction of 17 per cent in working hours.

Emphasizing the importance of keeping tools and automotive equipment serviceable, Mr. Humphrey said, "The type of automotive equipment and tools used have always been of vital importance, and attain still greater importance with any decrease in working hours and increase in wages. During recent years we have been buying trucks of higher quality and greater speed. We are getting more and more mileage, both with our passenger cars and trucks. Of the cars that were traded in during the past two years, the average was 86,000 miles and many vehicles operated more than 100,000 miles. We use depreciation rates which charge off the cost of our cars in about 60,000 miles; and the approximate 26,000 miles we average beyond this 60,000 miles when no more depreciation is charged, cost less per mile than the first 60,000 miles with depreciation. We maintain a central shop where all work is done on cars within the immediate vicinity of the shop, and cars from distant points are sent to the central shop for major repairs or general over-hauling."

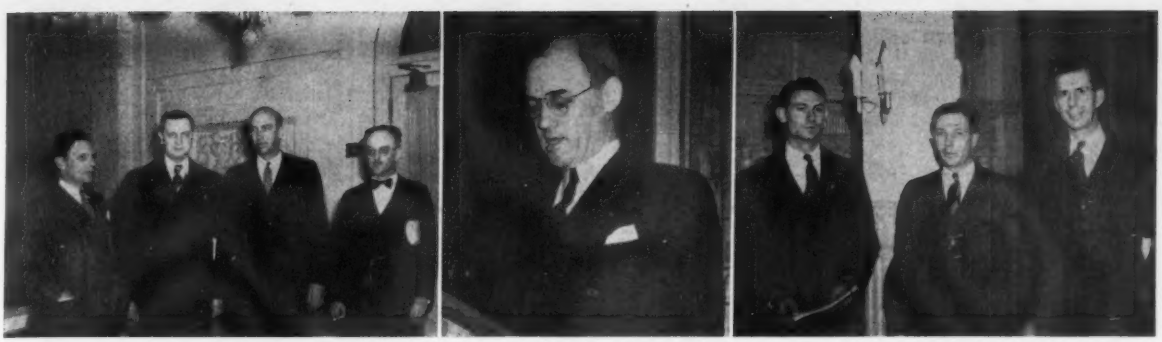
Some of the highlights of Mr. Humphrey's comment on operation and maintenance were:

"For lower voltage distribution lines, we use the fittings which are generally used throughout the country. For rural lines we use the same construction as for urban lines; that is, we place our two conductors on the ends of a standard crossarm except at corners where vertical construction is used. We believe that this construction is as cheap as vertical construction, and gives better operation. Vertical construction requires that about half of the poles must be 5 ft. higher than for flat construction, and even this allows for less separation than is obtained in horizontal construction. The additional height of the poles for vertical construction just about offsets the cost of crossarms for horizontal construction. If an additional phase wire is needed in the future the crossarm is necessary in any event. More radio interference is caused by the pole top metal pin construction than with the crossarm construction.

### Transformer Pole Grounding

"We formerly thought it quite necessary to keep all grounds away from a transformer pole, in the interest of safety to the men. We now find that considerable economies are realized by grounding together the transformer case, arrester, secondary, and any ground guys which may be on the transformer pole. Our men have learned to work just as safely with all of the grounded parts on the pole as they did previously when all grounds were so carefully kept away

**Left to right, E. H. Ginn, commercial vice president, General Electric Co., Atlanta; C. C. Curtis, president, Savannah Electric and Power Co.; Lewis Payne, president, Eastern Shore Public Service Co., J. G. Brown, electrical engineer, and F. C. Morton, general superintendent, both of Savannah Electric and Power Co.**



**Left to right, T. G. Seal, Ebasco Services, Inc., New York; John W. Talley executive secretary, Southeastern Electric Exchange, Atlanta; W. R. Doar, distribution engineer, Carolina Power and Light Co., Raleigh; V. R. Parrack, distribution design engineer, Carolina Power and Light Co., who participated in the program; George S. Humphrey, vice president, Potomac Edison Co., who addressed the conference on "Practical Distribution Economies"; Curtis Jones, distribution engineer, South Carolina Power Co., Charleston; J. T. Mason, distribution engineer, Virginia Public Service Co., Charlottesville, Va.; and W. L. Rush, distribution and transmission engineer, Louisiana Power and Light Co., Algiers, who presented a paper on "Operating Rural Lines."**

from the transformer pole . . . . .

"Our distribution transformer losses have been gradually decreasing, and for 1940 the total loss from all causes was 0.88%. The loss from lightning was 0.26% although during this year we had about the usual amount of lightning storms. We have 14,000 transformers, the average size being 7.3 Kw., and some of them are more than thirty years old. As stated previously we install lightning protection with each transformer, grounding together transformer case, arrester and secondary . . We give but little attention to the resistance of our ground connections, merely because our experience is quite satisfactory without such checking . . . . .

"We have realized a considerable economy by using Max-I-Meters for obtaining load readings on distribution transformers. Testing is done throughout the nine months of the year, (omitting June, July and August), although most of the checking is done from October through January. We have a table by which we estimate the December peak from readings taken during the other months. We allow loading up to 150% of nameplate rating, except in special cases where we know the load factor is high. Approximately 20% of our transformers are being tested each year, selecting those which the district engineer suspects may be loaded from his card and map records, and from knowledge of load conditions throughout his district . . .

"We have been doing live line work with rubber gloves on 6900 volt lines for several years and consider the practice satisfactory. For 12,000 volt (6900 volt to ground) lines, we have been making increasing use of insulated platforms rather than live line tools. We first used these platforms on a job of replacing 1500 insulators on a 13,200 volt line which was being changed to 33,000 volts. The men to be used on this job were given some preliminary training on a model of the pole top on which they were to work, and the job was done economically, and with no accidents of any kind."

### Distribution Developments

In his address on "Recent Developments in Distribution Equipment and Methods," Frank Starr, distribution engineer of General Electric Company, placed particular emphasis on capacitor applications. An analysis of reports and papers relating to applications by utilities reveal that the principal reasons for them are: (1) the reduction of voltage drops, (2) the reduction of amperes and kva de-

**Left to right, E. H. Bailey, transformer specialist, General Electric Co., Atlanta; W. L. Tadlock, distribution engineer, Commonwealth and Southern Corp., Birmingham; C. E. Arvidson, engineer, Commonwealth and Southern Corp., Jackson, Mich.; Frank Starr, distribution engineer, General Electric Co., Schenectady, N. Y.; I. W. Gross, engineer, American Gas and Electric Service Corp., New York City; Mr. Starr again, with J. J. Strickland, general superintendent, Durham Public Service Co., Durham, N. C. Arvidson, Starr and Gross addressed the meeting.**

mand, and (3) the reduction of energy losses; and that while capacitors have been applied at many points on the system, the most common utility application has been on the distribution feeder. He suggested that this use would continue to grow because capacitors may be installed on the distribution feeder at a lower cost than at any other place on the system, and because primary feeder capacity is greatly depreciated by lowered power factor, with the result that the benefits obtained on the feeder alone usually are sufficient to justify the application of feeder capacitors.

### Secondary Capacitors

Extensive studies have been made, Mr. Starr pointed out, comparing additional costs with additional benefits in the form of additional feeder and transformer capacity afforded by secondary capacitors. The most significant and important conclusion from this study are:

(1) On underground secondary networks, particularly those served by primary voltages of 11 kv or greater, the secondary capacitor can be justified in most cases.

(2) On overhead distribution systems with radial secondaries, particularly where the primary voltage is 4160 or 2400 volts, the secondary capacitor usually cannot be justified except at very low power factors.

(3) On overhead distribution systems with banked secondaries, the secondary application becomes much more attractive and may be justified largely because larger capacitors may be used and because of diversity effects.

An interesting analysis of the cause and correction of light flicker produced by theatre marquee sign flashers was presented by V. R. Parrack, distribution design engineer, Carolina Power and Light Co. Oscillograms of a specific installation indicated that the flashing load was producing a periodic voltage drop of 5.7 volts at a frequency of about 6 dips per second. The periodic voltage dips were so severe as to affect the quality of sound production in the theatre as well as to produce noticeable light flicker throughout the theatre.

Investigation indicated that the reconnection of the flashing load so as to put it all on one side of a three-wire service would result in the superposing of the current of the flashing circuits, and the reduction of both the current fluctuation and its frequency of occurence.

A checkup after this change was made indicated that the current fluctuation had been reduced from 35 amperes to 9 amperes, the periodic voltage drop was reduced from 5.7 volts to 1 volt, and the frequency of the dips was increased from 6 to 24 times per second. Lighting and sound equipment operation was entirely satisfactory under these conditions indicating that, contrary to the customary practice of balancing loads between hot wires of a three-wire circuit, it is much better to confine a fluctuating load of the type described to a single hot wire and neutral.

### Voltage Standardization

A discussion on "Standardization of Utilization Voltages," presented by C. E. Arvidson, distribution engineer, Commonwealth and Southern Corp., was enthusiastically received by the group, one engineer referring to it as "the most realistic approach to this difficult problem yet offered."

Mr. Arvidson discussed the trend in utilization voltages and enumerated the limitations imposed by existing equipment as well as other apparent obstacles to standardization.

"The first step toward standardization of utilization voltages should be the determination of a maximum utilization voltage spread for residential customers and the limiting values," Mr. Arvidson reported. "Such limiting values should recognize existing distribution equipment and design practices as well as existing utilization equipment, and would represent the maximum utilization voltage spread within which present and future utilization equipment would operate satisfactorily if not most efficiently. Such a spread and the limiting values have already been established by existing design practices and need only recognition and approval.

"Referring to the service voltages expected as the result of present distribution design practices, it can be seen that none of the 45 informant companies serving approximately 10,000,000 customers design for service voltages greater than 127 volts nor less than 110 volts. Since these companies are providing reasonably satisfactory service for the customers' utilization equipment, these values should represent reasonable maximum and minimum limits for the service voltage spread.

"The maximum utilization voltage spread for residential customers would be greater than the maximum service voltage spread

**Left to right, W. S. Gardner, line and service supervisor, R. F. McGee, district manager, and G. T. McElderry, division manager, all of Carolina Power and Light Co.; Chas. T. Brasfield, supervisor of service, Alabama Power Co., Birmingham; J. C. Gilliam, Savannah Electric and Power Co.; J. P. Spicer, Hubbard and Co., Richmond, Va.; and K. C. Lasseter, assistant to general superintendent, Savannah Electric and Power Co.**

# NATIONAL DEFENSE OF INDUSTRY

*against Corrosion!*

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**Left to right, Dave Galaher, chief load dispatcher, and C. V. Saunders, electrical engineer, both of Florida Power Corp.; T. J. Woth, district engineer, Westinghouse Electric and Mfg. Co., Atlanta; W. L. Garlington, substation engineer, also of Florida Power Corp.; R. O. Loomis, distribution engineer, Georgia Power Co., Atlanta; and G. D. McCann, of Westinghouse Electric and Mfg. Co., East Pittsburg. At Mr. McCann's right can be seen a portion of the mechanical analogy machine for representing traveling waves on transmission lines.**

by an amount representing a reasonable maximum voltage drop in the customers' wiring from the service entrance switch to the terminals of the utilization equipment. Consideration of Section 2202 of the National Electric Code and the data given in Tables I and III, inclusive, indicate that an allowance of zero volts minimum to three volts maximum should be reasonable for the voltage drops in customers' wiring. An agreement on these values and the maximum service voltage spread limits mentioned above would establish the maximum utilization voltage spread at 20 volts with limits at 107 and 127 volts.

"This maximum utilization voltage spread and limits of 107 to 127 volts were agreed upon by the Transmission & Distribution Committee, Edison Electrical Institute, at its meeting on February 19, 1941, (subject to confirmation by letter ballot), to be submitted to the Electrical Equipment Committee as tentative values for its consideration, with the further qualification that single phase motors shall be designed to start at momentary voltages as low as 90 volts. These limits are to be construed as 5 minute mean values at the appliance, with corresponding service entrance voltage limits of 110 and 127 volts, respectively.

"The next step in the interest of efficient appliance operation and future standardization should be the establishment of a preferred utilization voltage spread and its limiting values for residential customers. Such a spread should not be so small as to handicap distribution cost or the operation of future utilization equipment. The limiting values would represent the maximum utilization voltage spread within which present and future equipment would operate most satisfactorily and efficiently.

"Almost 80 per cent of the customers served by the informant companies receive service voltages between 113 and 125 volts. Allowing zero volts minimum and 3 volts maximum for voltage drops in the customers' wiring, a preferred utilization voltage spread of 110 to 125 volts is obtained. The remaining 20 per cent of the informant companies could come within these preferred limits and thus provide more efficient operation of their customers' equipment by changing their voltage levels only a small amount.

"This preferred utilization voltage spread and limits of 110 to 125 volts were agreed upon by the Transmission & Distribution Committee at its meeting on February 19, 1941, (subject to confirmation by letter ballot), to be submitted to the Electrical Equipment Committee as tentative values for its consideration. These limits are to be construed as 5 minute mean values at the appliance with corresponding service voltage limits of 113 to 125 volts, respectively."

In conclusion, Mr. Arvindson assured the gathering that "The maximum utilization voltage spreads of 107 to 127 volts, which have been tentatively agreed upon for residential customers, should be generally acceptable since this maximum spread represents compromises between the ability of the distribution system and the requirements of the utilization equipment which have already been made and which require only your recognition and approval. Your wholehearted acceptance of the preferred utilization voltage spread of 110 to 125 volts for residential customers will accelerate the trend toward a single standard of nominal service voltages. Tentative recommendations in regard to similar utilization voltage limits for 220 volt motors should be forthcoming in the near future and your continued interest and cooperation will be very helpful in the ultimate solution of this problem."

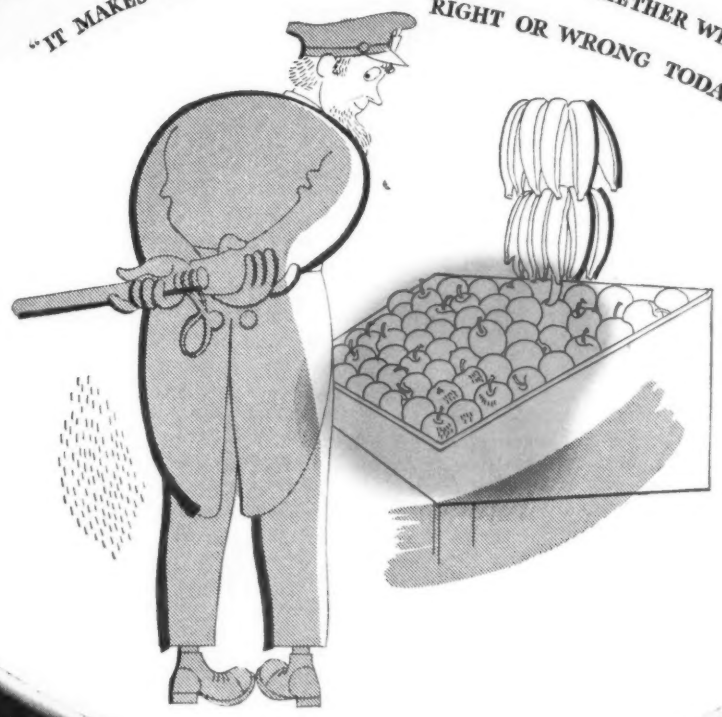
### Step-Type Regulators

"Operating Experience with Step-Type Feeder Voltage Regulators," was the subject of a paper presented by F. W. Bush, electrical engineer, transformer department, Allis-Chalmers Mfg. Co. Specific examples were presented to demonstrate that 5/8 per cent steps not only result in fewer regulator operations but also permit closer regulation. Mr. Bush also reported that seven years of operating experience had indicated that better regulation could be obtained on most feeders by the use of an integrating time delay in the control circuit of step regulators.

Emphasizing that one make of step regulator had a record of seven years of field experience without a single contact replacement due to deterioration in normal service, Mr. Bush said that it is generally conceded "that the contacts of a properly designed tap-changing mechanism should last as long as the rest of the regulator or the transformer parts." Tests during

*(Continued on page 61)*

"IT MAKES A DIFFERENCE TO ALL ETERNITY WHETHER WE DO RIGHT OR WRONG TODAY" *James Freeman Clarke*



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APPLIANCE Service

# Short Cuts in Vacuum Cleaner Servicing

By John Garrison

AS far as numbers go vacuum cleaner service is big business. Some dealers are cashing in on the service of these appliances, while others seem afraid to invest the few dollars that are required to fit up a work bench to handle this class of work. Like any piece of machinery, wear begins the moment a vacuum cleaner is put into use, and eventually even the best cleaner will need some form of service. One or two overhauls of this type a week will go a long way in making better times for any shop, especially the smaller ones.

The labor dollar that comes from cleaning out a vacuum cleaner motor and perhaps replacing a brush or two is worth just as much as a dollar made in any other manner, and a fairly large percentage of the jobs that come in will require a new armature or a set of field coils, which will result in a charge of $5, $8, $10 or more. One shop that has kept a record for almost two years reports that the average cleaner job averages a little under $5, of which about $3 represents labor and profit on parts.

Only ordinary mechanical skill is required to service vacuum cleaners and just a reasonable electrical knowledge. The motors used are mostly simple series types in which the armature, field coils, brushes and bearings are the only parts that require much servicing. Of these, the armature is most often the cause of trouble. Armature troubles, in turn, are caused by worn bearings that allow the armature to drag on the poles; worn out or burned commutator; sticking, jamming or overloads; low voltage; or defects in the original winding of the armature.

Vacuum cleaners of the home size, which are of course in the majority, use but little current when in proper condition. Any defect in the armature, fields or bearings will result in running hot, a reduction of speed, sparking at the brushes, and high current draw. Therefore the first test to be made is to plug the cleaner into the line and observe the operation. Violent arcing on the commutator may be caused by worn or dirty brushes, or burned bars, as well as by shorts in the armature.

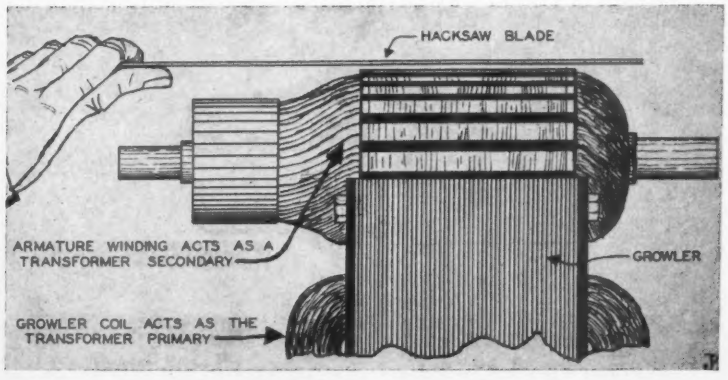


**Fig. 1. Vacuum cleaner motor armatures can be tested for shorts, opens and grounds on a growler. The test for locating a short in an armature is shown here.**

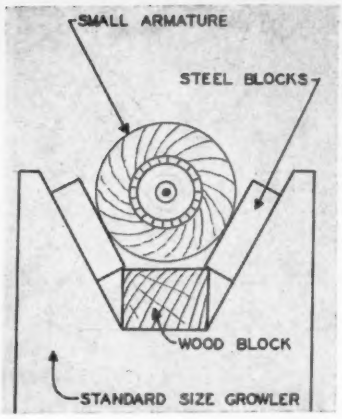


**Fig. 2. A standard size growler can be adapted for small vacuum cleaner motor armature testing. Two steel blocks placed against the sides of the growler and separated at the bottom of the V by a block of wood will position the smaller armatures for reliable testing.**

One of the best methods of making a quick check is to place an ammeter of the right type (a-c or d-c as the case may be) in series with the cleaner motor and take a reading while the motor is running. The usual reading on a 110-volt cleaner motor will be about 2 or 3 amperes. If the armature or the fields are shorted, the current path through the motor will be shortened that much and the reading will go up to 8, 10 or even 15 amperes.

## Growler for Armatures

The armatures can be thoroughly tested in a growler such as used for direct current armatures. In fact most, of the small 110-volt series motors in use will operate on alternating or direct current. Figure 1 shows the method of testing an armature of this type in a growler. The growler winding acts in the manner of a primary of a transformer, and the armature winding acts as a transformer secondary. If no short is present in the armature a hacksaw blade passed over the armature will not vibrate or pull down to the armature. If a short is present, a heavy current is set up in the armature and the blade will be attracted and held down to the armature with a loud buzzing noise. The armature must be turned in the growler so as to test all sides.

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UNION INSULATING CO., 27 Park Place, New York City

made for armature testing on small appliance motors, and these are very handy to use for small motor work. However a larger standard size growler, such as used in automobile generator work, can be made to do the job nicely if the armature is blocked up as shown in Figure 2. Two steel blocks supported and held apart by a wooden (or non conductor) block at the bottom will narrow the jaws sufficiently to accommodate the smaller armature, the top half of which should be above the top of the growler for best results.

If no shorts show up in the armature, it should be tested for grounds and open circuits. The former is easily found by testing with 110-volt current between the commutator and the shaft. A light bulb should be in series with the power line to protect the fuses in case a ground is present. Open circuits are often visible to the eye. Look for burned spots in the insulation, especially close to the commutator, where the small wires that comprise the winding may be melted in two. In some cases, the wires that connect the winding to the commutator bars break from vibration, and these breaks may be concealed under the banding or insulation. In many cases, the break is right at the commutator bars where the solder has melted and been thrown off, leaving the coil leads in the slots but without making an electrical connection. Open circuits of any kind usually cause the commutator bars affected to become burned, while the other bars will remain smooth.

### Replace Defective Armatures

It seldom pays the small shop to try to rewind or repair a defective armature of the size used in vacuum cleaner motors. The armatures are so small and the wire is so fine that such rewinding does not lend itself to hand work. Most of these small armatures are wound on machines and when one goes bad it is best to buy a new one or send the old one for rewinding to a concern that specializes in this work.

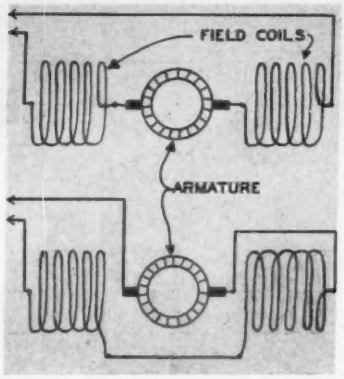



**Fig. 3. Most vacuum cleaner motors use one of the two circuits shown above. The upper type is the most popular. It is important to know the type of field connection when testing field coils for current draw.**

The circuits of the small series motors are simple and easy to understand. Figure 3 shows the two circuits that are most generally used in cleaner motors. A few machines use a dual field so that the cleaner has two power ranges or working speeds. Where this is done the second field circuit is cut in or out by a switch, but the same general principles are involved.

As can be seen in Figure 3 (top) the usual motor of this type has two field coils, one on each side of the armature. The current flows through one coil to a brush, then through the armature windings, out the other brush, through the second field coil and back to the other side of the line. Thus the same current must pass through each of the field coils and through the armature. If any one of these becomes short circuited a large part of the resistance is eliminated from the circuit and a much larger current will flow. Therefore, if the machine is kept in operation under this condition the remaining part of the circuit soon becomes overheated and "burned out."

The lower diagram of Figure 3 shows another circuit that is sometimes used. Here the current goes through both field coils first, then through the armature last. There is no difference in the operation of a motor with this circuit, and if trouble develops the results will be the same as with the other circuit. The type of circuit does make a difference, however, when it comes to testing the field coils, and for this reason the service man should make sure which connection he is working with before testing the fields for shorts.

### Testing Field Circuits

Figure 4 shows a simple method of testing the field circuits in a small series motor. For this, a 6-volt battery is used and the current is sent through one field coil at a time and measured with an ammeter. Both field coils should give the same reading if they are in good condition. The testing is done without removing any connections as shown in the diagram. One test point is held to a brush holder and the other to the other end of the field coil where it comes out of the motor field housing. After one side is tested, the test is repeated from the other brushholder to the other external connection. Following this test, try for a grounded condition with 110-volt test points from each brush holder to frame.

In case the field circuit is like that shown in the lower diagram of Figure 3, this test will not work in this manner. In a case of this kind, one brush holder is connected directly to one of the external leads and the test will show a short. Fields that are directly connected can be tested separately by untaping the jumper between the two coils and then testing from the middle to each end of a field coil.

The remaining repairs to a vacuum cleaner are mostly mechanical in nature and are easily accomplished by any mechanically minded person with a few tools. Even a major overhaul on the average cleaner requires but an hour or two, and for this reason this class of work is profitable to the shop because it can be made to fill in the spare hours between bigger jobs, hours that probably would be wasted from a dollar point of view.

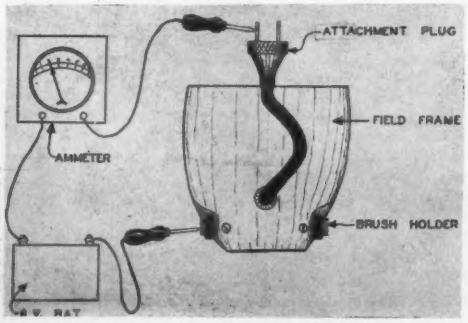
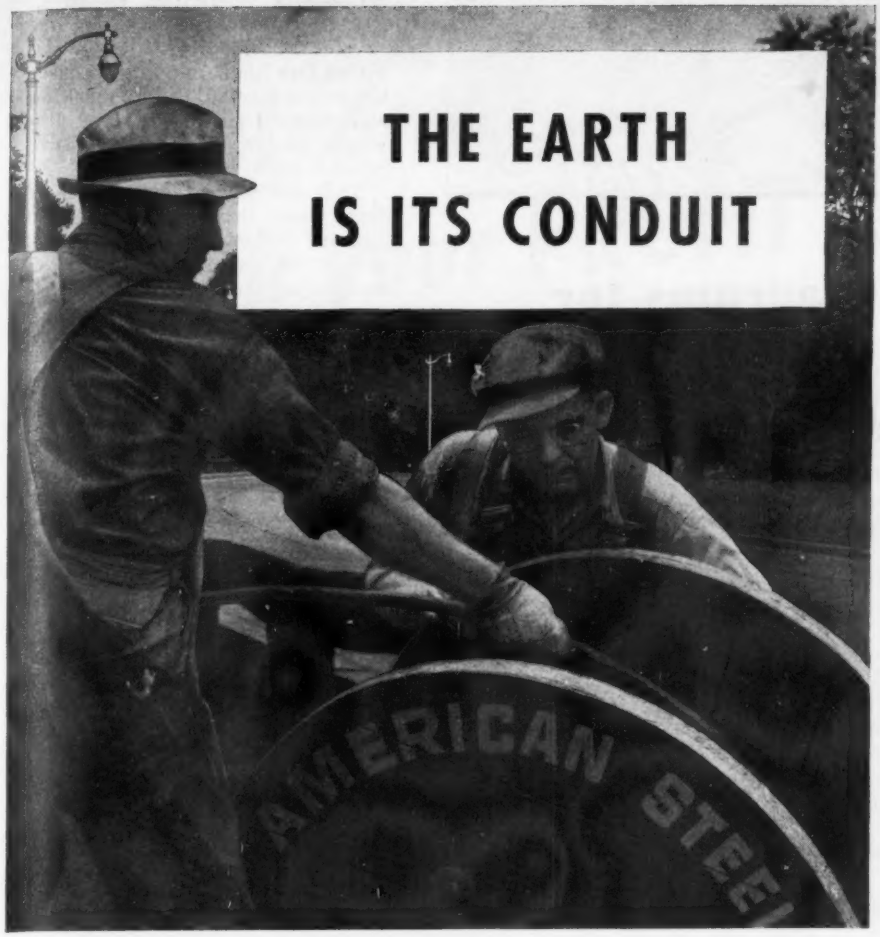
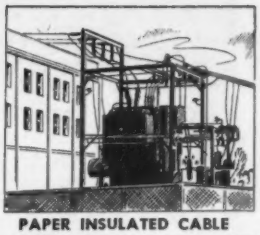



**Fig. 4. The field coil test is made from a brush holder to one prong of the attachment plug. Then the same test is repeated on the other brush holder and prong. If both sides test the same the field connections are as shown in the top diagram of figure 3; if one side shows a dead short the connections are as shown in the lower diagram of figure 3, or the field coil is defective.**



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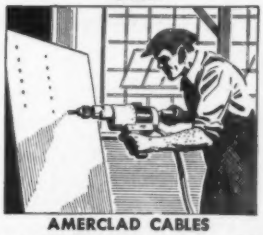

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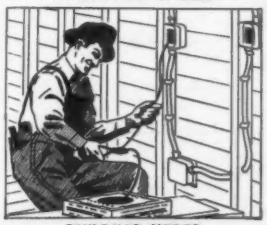

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**UNITED STATES STEEL**

MOTOR Service

# Connecting Diagrams for Lap Wound A-c Motors

By A. C. Roe

Railway Motor Engineer
Westinghouse Electric & Mfg. Co.

THIS article presents the first of the twelve-pole, three-phase diagrams. In addition, there is provided a table that indicates the finding factors for use in the table in the March 1941 issue. The new table in this article provides data for figuring turns and wire size for new windings, etc., as well.

The twelve-pole, three-phase, series-star connection, shown in Fig. 55, is arranged for either three or nine leads, or for single or dual voltage. The dotted line jumpers can be cut open at the points indicated and the six ends marked as shown, making a nine-lead series or two-parallel star connection.

The twelve-pole, three-phase, series-delta connection, shown in Fig. 56, is arranged also for three or nine leads, as indicated by the dotted line jumpers. If cut open at the points marked, the six resulting ends marked $L_1$, $L_2$, etc., will provide a dual voltage series or two-parallel delta connection.

Thus any series diagram, two or three phase, that is arranged top to top, and bottom to bottom as Figs. 55 and 56, can be cut open at the middle jumper of each phase and converted into a dual voltage diagram. This is a useful fact to remember.

### Rewinding for New Voltage

There are a number of cases where it is desired to change a winding for a different voltage that can only be obtained by redesigning the winding with new turns and a different size conductor. For these cases, Table I has been prepared.

It will be noticed that Table I has been arranged into voltage classes and that no provisions are made for new windings in a higher voltage class. This is done to avoid trouble with insufficient slot room and creepage distances required for higher voltage classes.

It is suggested that the repair-

## Table I—Turn and Copper Area Multipliers for Voltage Change Calculation

| Voltage Change From: | To: | Multiplier for Turns* | Multiplier for Copper Area |
|---|---|---|---|
| 110 | 220 | 2.00 | 0.50 |
| | 440 | 4.00 | 0.25 |
| | 550 | 5.00 | 0.20 |
| 220 | 110 | 0.50 | 2.00 |
| | 440 | 2.00 | 0.50 |
| | 550 | 2.50 | 0.40 |
| 440 | 110 | 0.25 | 4.00 |
| | 220 | 0.50 | 2.00 |
| | 550 | 1.25 | 0.80 |
| 550 | 110 | 0.20 | 5.00 |
| | 220 | 0.40 | 2.50 |
| | 440 | 0.80 | 1.25 |
| 1100 | 110 | 0.10 | 10.00 |
| | 220 | 0.20 | 5.00 |
| | 440 | 0.40 | 2.50 |
| | 550 | 0.50 | 2.00 |
| 2200 | 110 | 0.05 | 20.00 |
| | 220 | 0.10 | 10.00 |
| | 440 | 0.20 | 5.00 |
| | 550 | 0.25 | 4.00 |
| | 1100 | 0.50 | 2.00 |

| Voltage Change From: | To: | Multiplier for Turns* | Multiplier for Copper Area |
|---|---|---|---|
| 3500 | 110 | .0315 | 31.80 |
| | 220 | .0630 | 15.90 |
| | 440 | .1257 | 7.95 |
| | 550 | .1572 | 6.36 |
| | 1100 | .3150 | 3.18 |
| | 2200 | .6300 | 1.59 |
| 4500 | 110 | .0244 | 41.00 |
| | 220 | .0488 | 20.50 |
| | 440 | .0978 | 10.22 |
| | 550 | .1220 | 8.20 |
| | 1100 | .2440 | 4.10 |
| | 2200 | .4880 | 2.05 |
| | 3500 | .7780 | 1.28 |
| 6600 | 110 | .0167 | 60.00 |
| | 220 | .0334 | 30.00 |
| | 440 | .0668 | 15.00 |
| | 550 | .0835 | 12.00 |
| | 1100 | .1670 | 6.00 |
| | 2200 | .3340 | 3.00 |
| | 3500 | .5300 | 1.89 |
| | 4500 | .6820 | 1.47 |

* This multiplier can be used as finding factor for use with Table I of March 1941 issue.

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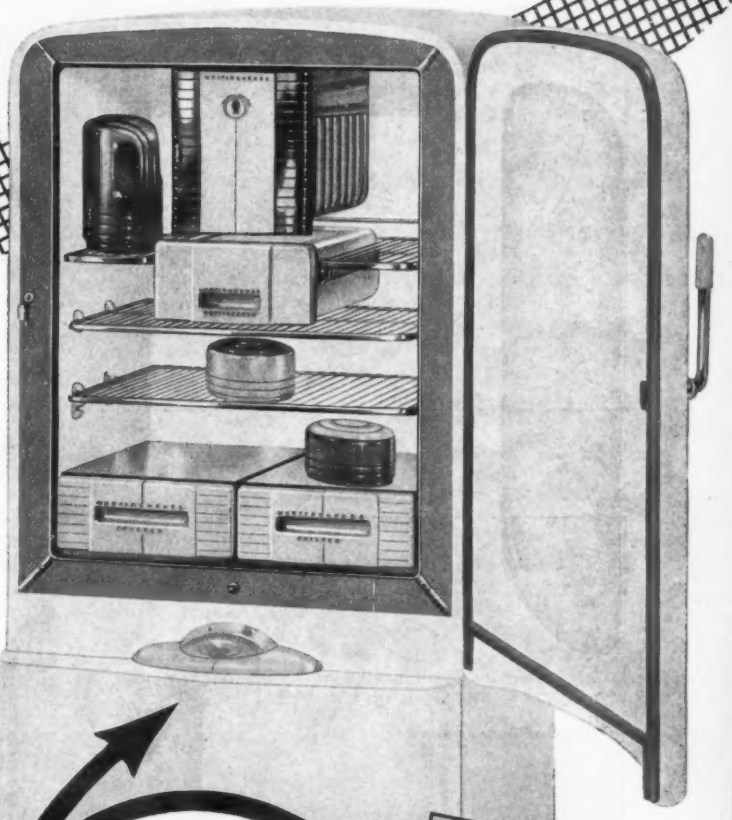

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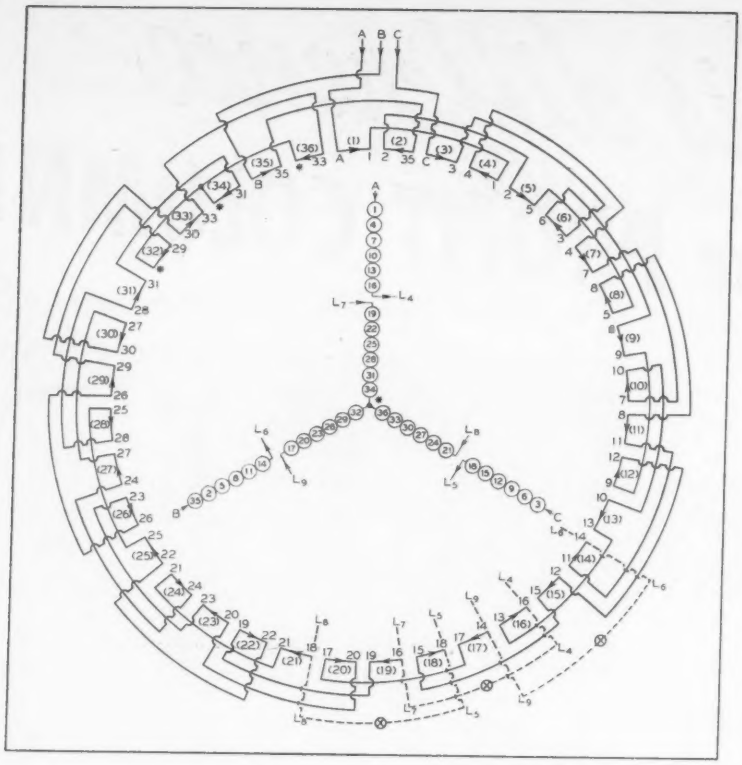


**Fig. 55. Series or parallel star connection for 12-pole, three-phase, lap-wound induction motor with three or nine leads.**

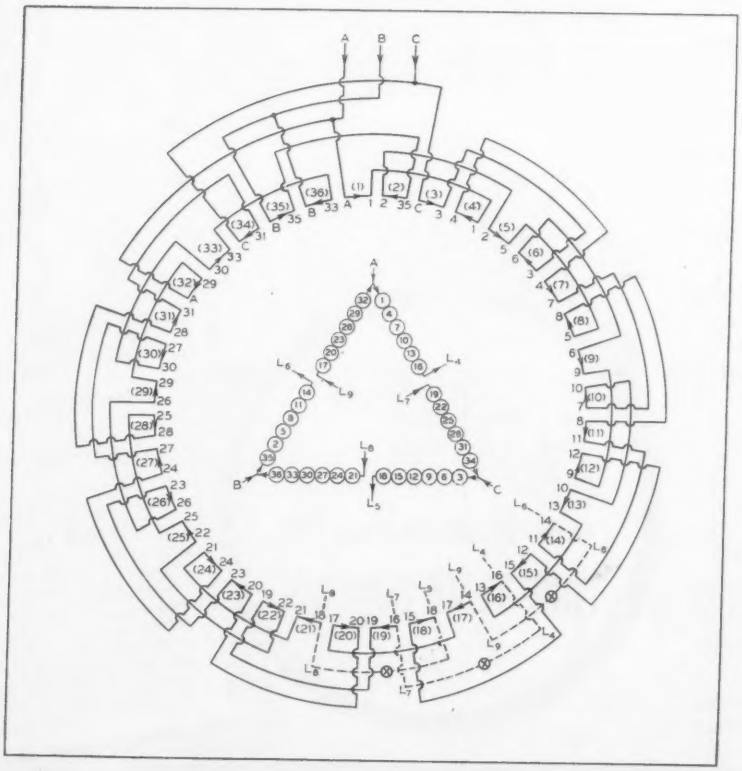


**Fig. 56. Series or parallel delta connection for 12-pole, three-phase, lap-wound induction motor with three or nine leads.**

man compile data on high voltage windings as to type of coil insulation in slots and ends, internal coil insulation, projection of coils on each side of core iron, clearance end brackets, end of winding, etc. With data of this nature, it might be possible occasionally to fit a higher voltage winding into a lower voltage frame.

When reducing from a high voltage such as 6600 to 2200, etc., the external and internal coil insulation can be reduced and in many cases the copper area can be increased in greater proportion than that indicated in Table I. An approximate rule to remember is that the horsepower rating can be increased one half the per cent increase in copper area. For example, if the copper area is increased 10% above that required for Table I, the horsepower can be increased 5%.

There are two factors provided in Table I. The first one indicates how the turns per phase or coil must be changed; the second factor is used to provide the proper copper area. These factors multiplied by 100 are the per cent increase or decrease required in number of turns and copper area.

For example to change a 440-volt winding to 550 volts by rewinding, Table I shows that the turns must be increased 1.25 times and the copper area reduced to 0.8 of the original area. A wire table should be used to convert the wire size to area

*(Continued on page 61)*

## Table 2

### Dual Voltage Connection For 3-Phase Star

**For High Voltage:** Connect A, B, and C to lines; connect $L_4$ to $L_7$; connect $L_5$ to $L_8$; and connect $L_6$ to $L_9$.

**For Low Voltage:** Connect A and $L_7$ to A-phase line; connect C and $L_8$ to C-phase line; connect B and $L_9$ to B-phase line; and connect $L_4$, $L_5$, and $L_6$ together.

### Dual Voltage Connection For 3-Phase Delta

**For High Voltages:** Connect A, B, and C to lines; connect $L_4$ to $L_7$; connect $L_5$ to $L_8$; and connect $L_6$ to $L_9$.

**For Low Voltages:** Connect A, $L_7$, and $L_6$ to A-phase line; connect C, $L_8$, and $L_4$ to C-phase line; and connect B, $L_9$, and $L_5$ to B-phase line.

# NEWS of the INDUSTRY

## S. C. Utility Continues Expansion Begun Last Year

The continuing growth of Columbia, South Carolina, and its metropolitan area has made it necessary for the South Carolina Electric and Gas Company to budget another large program for the construction of additional electric facilities, it was announced recently by Walter Herbert, director of the electrical utilities division of the state public service commission.

Approximately $1,000,000 will be spent by the company this year on new and larger facilities for the distribution of electric power in Columbia's metropolitan area. Important increases in facilities at Fort Jackson and for Columbia's industry must be made.

The new construction program for the year, including the installation of sub-stations and transformers and new circuits, is reflected in an order issued by the public service commission.

The order permits the company to carry out a refinancing program which will make available certain additional funds to be expended on the construction program.

Last year the company, in keeping pace with the tremendous building in this area, spent slightly more than $1,000,000 on new and necessary distribution facilities. Now it has launched another program expected to be almost as large.

---

## Dallas Pow. & Lt. Names MacGregor as President

Appointment of George L. MacGregor as president and general manager of the Dallas Power & Light Company was announced following a meeting of the Board of Directors of the company on March 11.

Mr. MacGregor has been acting chief executive of the company since the death of the former president, C. W. Davis, in September, 1939. He was made a vice-president and assistant to the president in March, 1939, and vice-president and general manager in March, 1940.

Other officers reappointed by the board were: W. E. Holland, vice-president; W. G. Moore, vice-president; H. B. Parris, secretary and treasurer; H. G. Elmore, assistant secretary and assistant treasurer, and W. Autry Norton, general counsel.

G. L. MacGregor

At the annual meeting of stockholders held before the board meeting, the following directors were re-elected: Frank E. Austin, H. K. Doyle, E. L. Flippen, W. E. Jones, George W. Loudermilk, G. L. MacGregor, H. B. Parris, F. M. Ryburn and Edward Titche.

Mr. MacGregor joined the D. P. & L. Company in 1929 as a power salesman. He has lived in Texas practically all of his life and is a graduate in electrical engineering from the University of Texas. He is president of the Dallas Electric Club, chairman of the Defense Training Committee of the Dallas Chamber of Commerce, a director of the Community Chest and of the Dallas Kiwanis Club.

At the meeting of stockholders, Mr. MacGregor announced that on December 31, 1940, the company was serving 92,010 customers, compared with 87,246 on the same date in 1939. This represented a gain of 4,764 customers, or 5.5 per cent.

Electricity sold by the company last year showed a gain of 3.3 per cent, and revenue from the sale of electricity rose 2.5 per cent. Operating expenses increased 2.9 per cent and net operating revenues rose approximately 2 per cent. A rate reduction put into effect last summer served principally to prevent a larger gain in revenue.

"The far-reaching results of rate cuts during the last ten years is strikingly brought out by the fact that household customers of the company paid an average of 3.76 cents per kilowatt-hour in 1940, compared with 5.75 cents in 1930," Mr. MacGregor told the stockholders. This represented a

**This photograph might be entitled "Hands Across the Mississippi Power and Light Company" as Charles E. Wilson (left), president of the General Electric Company, reaches across Rex I. Brown, president of M. P. & L., to shake hands with Mississippi's Governor Paul W. Johnson. The hand shake took place during a banquet attended by leading industrialists and states' representatives dedicating General Electric's new million-dollar fluorescent lamp works at Jackson, Miss.**

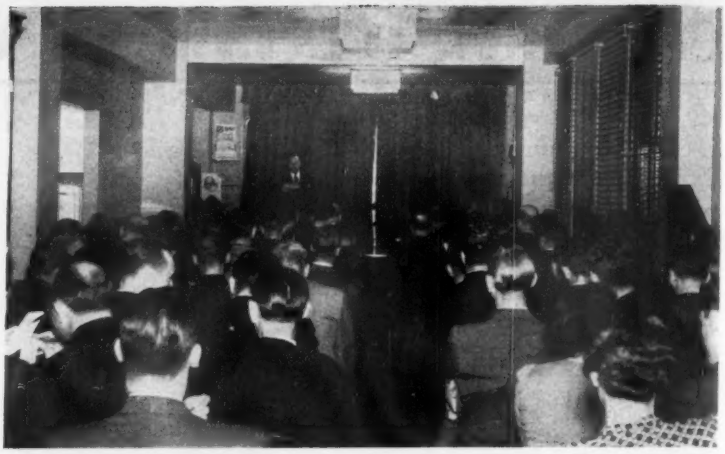
drop of approximately 35 per cent. The rate cut made last summer, which was of principal benefit to commercial and industrial customers, was the seventh major reduction in electric service rates made by the company since the close of 1928.

Mr. MacGregor pointed out that practically all of the increase in operating revenues of the company during 1940 was required to provide for the payment of increased taxes, and that for the first time in the history of the company, taxes rose in 1940 above payroll costs charged to operations. The tax bill of the company last year, which was charged to operations, was $1,338,207; this was equal to approximately $1,400 for each employee of the company. Out of each dollar paid to the company by customers in 1940, 19 cents was required for taxes, compared with 9 cents for each dollar in 1930.

Including payroll charged to construction and other accounts, as well as to operations, the company's payroll for 1940 totaled $1,711,800. This expenditure, Mr. MacGregor said, was an important factor in promoting the welfare of Greater Dallas, because it materially increased the purchasing power of the Dallas metropolitan area.

The new Greenville Avenue Substation, under construction by the Dallas Power & Light Company, as well as the 60,000-volt line being built to that substation from the Cedar Crest Substation of the company, soon will be in service, Mr. MacGregor also said. Construction is under way on a 60,000-volt line from the Mountain Creek generating plant to the site of the airplane factory of North American Aviation, Inc., near Dallas, Mr. MacGregor said.

"No single industry has ever been more vital to the welfare of a nation than the electric utility industry is to the United States today," Mr. MacGregor declared. "Electric power is a prime essential to the national defense program, and the fact that the electric utility industry is ready now to meet the requirements of that program for vast amounts of power, superimposed upon normal demands, means that we can give the green light to armament factories to proceed with their job of re-arming America in double quick time without waiting for additional electric generators and lines to be installed."



**When "Alice" went into Electric Wonderland last fall, utilities and dealers went to town. For the Alice Show, conceived by The Modern Kitchen Bureau, proved one of the most popular and profitable pushers in electric range selling history. The Electric Institute of Washington, D. C., used the campaign most advantageously. Above, the audience waits for "Alice in Electric Wonderland" as the Fall Campaign of the Electric Institute of Washington is introduced by J. S. Bartlett, managing director. Below is the "Alice" cast, all staff members of the Electric Institute.**

## Cash Prizes Offered for Work in Home Lighting

Utilities throughout the country will find a splendid incentive to increased activity in the home lighting field in a series of substantial cash prizes just announced by the Home Lighting Equipment Sales Committee of Edison Electric Institute. The prizes are offered by the Committee for the best all-round job of promotion and sales of home lighting equipment during the first six months of 1941.

First award will be $500; second award, $200; third award, $100; and there will be four awards of $50 each.

Entries should cover the entire period beginning January 1, 1941, and ending June 30, 1941. There may be special concentrations of promotion and sales effort during this period, or a sustained activity throughout, but activities and results for the full six months should be incorporated in the entry.

Judging will be based on Plans and Methods and on Operations and Results. Plans and Methods will include the ingenuity of sales promotion and advertising, the value of training and sales programs, the scope of activities, and the method of presentation to sales organizations.

Operations and results will include the effectiveness with which the plans are carried out, the unit sales in relation to total domestic customers, and the load building values of the various types of equipment sold. Due consideration

## AUTOMATIC DEFROSTING
### . . . and the three additional features which make it possible only in Norge!

Record-breaking sales to date already show that the Norge Night-Watch is recognized by women the country over as the greatest refrigerator advancement of the season . . . because it releases them from defrosting muss and fuss and gives them better refrigeration *all day every day.*

And now ready for action when more buyers than ever are ready to act is the greatest of all Norge promotions . . . the biggest profit-building retail selling event Norge has *ever* announced . . . built around this amazing Night-Watch:

- ★ **SMASHING, COLORFUL NEWSPRINT TABLOID** for wide circulation
- ★ **SPECIAL FREE OFFER FOR NORGE OWNERS**
- ★ **TRAFFIC-STOPPING WINDOW DISPLAYS** that will draw 'em in
- ★ **ATTENTION-GETTING, ANIMATED DISPLAY** that sells the Night-Watch as it demonstrates
- ★ **COMPELLING RADIO CONTINUITIES** to build more traffic
- ★ **POWERFUL NEWSPAPER ADS** to tie in with . . .
- ★ **FULL-COLOR NATIONAL ADVERTISING** that carries the Night-Watch story to millions of homes

Norge dealers, now in action, report: "Night-Watch promotion is a 'natural' . . . it's got everything to pull in buyers and sell them."

### HERE'S THE FEATURE THAT WOMEN WANT

*Only* **$14.95**

BIG NEWS of the Norge Traffic-Builder is the separate Night-Watch Automatic Defroster for only $14.95, list, available for any new or previous Norge model that's equipped with three exclusive Norge features that make possible fully automatic defrosting . . . Safety-Sealed Fast-Freezer, Handefroster defrost receptacle and always-usable Coldpack fresh meat drawer. Hundreds of thousands of these models are already in use . . . every owner of one of them is a natural Night-Watch prospect.

Norge Models S-663, S-664P, S-903 and S-884P have the Night-Watch Automatic Defroster as standard equipment.

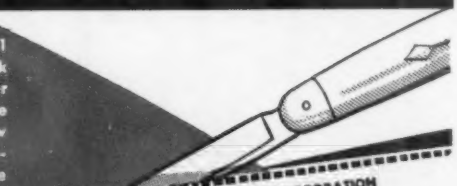
The Night-Watch can be plugged in on Models M-661, M-662 and M-902, because they are equipped with the three exclusive Norge features that make perfected automatic defrosting possible.

### NORGE NIGHT-WATCH DEFROSTING NOW COMES TO BIG-VOLUME MARKET

Standard equipment on four Norge 1941 models, the separate Night-Watch clock at $14.95 is now available for other Norge models which have the three big exclusive Norge features . . . now brings the advantages of nightly automatic defrosting to the big volume market . . . gives Norge dealers a decided edge in the price bracket where there's volume and extra profit. See your Norge Distributor now or mail the coupon at the right.

*Dealers and Users:*

*See* NORGE *Before You Buy!*



NORGE DIVISION BORG-WARNER CORPORATION
670 EAST WOODBRIDGE, DETROIT, MICH.

RUSH full information about your NIGHT-WATCH TRAFFIC-BUILDER PROMOTION. No obligation, of course.

Name .....

Firm .....

Address .....

City, State .....

will be given to the size and the type of territory served.

Entries must be submitted to the Home Lighting Equipment Sales Committee, Edison Electric Institute, 420 Lexington Avenue, New York, not later than August 1, 1941.

## Southern Entries Win in Water Heater Contest

Southern utilities among the prize winners in the Fall, 1940, Electric Water Heater Window Display Contest, sponsored by the Modern Kitchen Bureau, were the Knoxville Electric Power & Water Board, Knoxville, Tenn., second prize winner; East Tennessee Light & Power Co., Elizabethton, Tenn., and Florida Power & Light Co., Miami, Florida, joint winners of the third prize.

Entries were received in the contest, which closed January 15th, from utilities and dealers in all parts of the country. Many displays used Donald Duck display material supplied by the Bureau which proved highly effective.

The Knoxville Board's entry, which was submitted by Charles B. Tombras, showed a little boy's head being scrubbed by a moving hand, and the message "Hot Water for Every Need." Photographs and two water heater models also formed part of the display.

The Tennessee Power Co.'s display, entered by C. B. Wall, used Donald Duck to remind customers of the discomfort endured in past winters with old-fashioned water heaters.

S. R. Wilson, of the Florida Power & Light Co., submitted a display that showed a giant hand holding bridge cards and the message, "A Winning Hand . . . No need to worry about a full house with automatic electric service."

The Modern Kitchen Bureau will offer three contests in its water heater programs for 1941. The best floor demonstration of electric water heaters, the best electric water heater floor display and the best window displays will earn a total of $2,000 prize money. For full details on these contests, write the Bureau at 420 Lexington Avenue, New York City.

**The Modern Kitchen Bureau has just announced the winners in the Fall 1940 Electric Water Heater Window Display Contest. Cash prizes have been awarded to the following: first przie, top, C. M. Griffin, Ohio Edison Company, Youngstown, Ohio and second prize, bottom, C. P. Tombras, Knoxville Electric Power & Water Board, Knoxville, Tennessee. Ten other awards were also announced.**

## Farnsworth to Manage Ga. Power Merchandising

The appointment of William B. Farnsworth as merchandise manager for Georgia Power Company was announced recently by O. M. Jackson, sales promotion manager.

**William B. Farnsworth**

Mr. Farnsworth joined the Georgia Power Company in 1925, directly after graduation from Georgia Tech. He served successively as buyer in the purchasing department, assistant district office manager, aide to the assistant merchandise manager, assistant sales manager of the Macon properties, and as sales supervisor of the Augusta division.

He was transferred in 1931 to Rome as district sales supervisor and remained in that position until 1934, when he was promoted to the post of assistant merchandise manager with headquarters in Atlanta.

## Alabama Dealers Offer Prizes to Best Salesmen

Cash prizes of $1,000 are being offered in a co-operative 60-day range and water heater campaign, sponsored by the Alabama Electrical Appliance Dealers Association. The drive opened March 23 with 10 distributors of these appliances cooperating. Prizes include statewide offers of $100, $75, and $35 to salesmen who exceed set quotas by the largest percentages, also zone prizes offered by each of the distributors.

Old and shop worn ranges and heaters will count toward prizes as well as new merchandise and salesmen will be given 15 days after the end of the contest to get the units delivered and in opera-

# BULL DOG PIONEERS AGAIN!

*This end view of a three phase unit of "LO-X" shows how reactance drop is kept to a minimum through extremely close spacing of bus bars—the air gap being supplemented by a sheet of woven glass insulation.*

# *New!* "LO-X" BUStribution DUCT

## *Low Reactance Design—Reduces Voltage Drop*

*No longer need you "starve" your motors—or "heat your building with electricity." No longer need you pay for current "lost in transit."*

Now voltage drop due to reactance can be cut to a minimum by using Bull Dog's *new* "LO-X" BUStribution DUCT—a new product of more than fifteen years of pioneering in the field of flexible electrical distribution.

For installations such as welders, induction ovens and furnaces, especially at low power factors, "LO-X" BUStribution DUCT affords a high load capacity, better voltage regulation, and consequently more efficient and uniform operation.

In addition, "LO-X" is particularly desirable for long feeder runs at usual power factors, providing an economical means of reducing line drop below a point made possible by any other system.

"LO-X" BUStribution DUCT is available in from 500 to 4,000 amp. capacity, 600 volts or less, single phase, three phase, and three phase 4 wire. It may be used alone or combined with Standard "Plug-in" type BUStribution DUCT.

Write for detailed information, or better yet, ask to have a Bull Dog sales engineer call on you.

**BULL DOG**
**ELECTRIC PRODUCTS CO.**
DETROIT, MICHIGAN
Bull Dog Electric Products of Canada, Ltd., Toronto, Ontario

*Originators of Flexible Electrical Distribution Systems*

**MANUFACTURERS of Vacu-Break Safety Switches, Panelboards, Circuit Master Panels, Switchboards, Duct Systems—FOR LIGHT AND POWER**

tion. Certain minimum standards are set before a salesman becomes eligible for a prize.

Cooperating distributors are Graybar Electric Co., (Hot Point); Watts-Newsome Co., (Universal-Clark); Alabama Appliance Co., (Gibson-Rex); Matthews Electric Supply Co., (General Electric); R. P. McDavid Co., (Cavalier-L. & H. Sepco); Birmingham Electric Battery Co., (Norge); Moore-Handley Hardware Co., (Westinghouse); Steel City Supply Co., (Crosley-Pemco); Stewart-Warner Distributor Co., (Stewart-Warner), and Nash Kelvinator Corp., (Kelvinator).

## IES President Will Address Georgia Chapter

President A. D. Cameron, of the Illuminating Engineering Society, will be the featured speaker at a one-day conference of the Georgia Chapter, IES, in Atlanta, on April 11th.

A. D. Cameron

Others who will address the conference include Roy A. Palmer, of Duke Power Co., a regional vice-president of IES; S. G. Hibben, Westinghouse Lamp Division, Bloomfield, N. J.; and H. J. Chanon, General Electric Lamp Department, Nela Park.

A dinner-dance is scheduled for the evening of April 11th, honoring President and Mrs. Cameron.

## Kitchen Bureau Appoints Five New Regional Directors

Five new regional directors, all utility executives of long experience and knowledge of cooperative new business activities, have been appointed by The Modern Kitchen Bureau. The Directors will represent the Bureau in their respective states, assisting dealers and utilities in carrying out campaigns and taking positions of leadership in the electrical appliance sales activities in their states.

The five new Regional Directors, their positions and companies are:

Sam Brolund, general sales manager, Kansas Gas & Electric Co., Wichita, Kansas.

A. C. Crandall, vice-president, Indianapolis Power & Light Co., Indianapolis, Indiana.

Robert H. Giedd, new business manager, Florida Power Corporation, St. Petersburg, Florida.

G. W. Milliken, vice president, Southern Colorado Power Co., Pueblo, Colorado.

L. F. Riegel, general sales manager, Gulf States Utilities Company, Beaumont, Texas.

The total of eighteen regional directors of the Bureau have been so selected that in every state or group of contiguous states there will be an official of The Modern Kitchen Bureau permanently located and ready to assist the electrical dealers and utilities in his region in their use of Bureau promotional activities.

L. F. Riegel

## Perry Joins Electric Supply Company

**Wiley Crowe, left, president of The Electric Supply Company, Atlanta, shakes hands with a former competitor, J. J. (Joe) Perry, who now becomes vice president and sales manager of the Supply Company. Mr. Perry is well known throughout the Southeast having served for many years as southeastern district manager for General Electric Supply Corp., and more recently, as vice president and sales manager of Economy Electric Supply Co., Atlanta. The Electric Supply Company also operates a branch in Albany, Ga.**

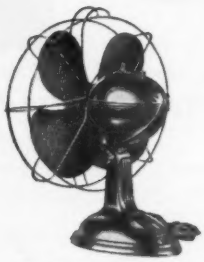
Robert H. Giedd

## Graybar Completes Agency Arrangement with Ohio Brass

An agency arrangement between Graybar Electric Company and the Ohio Brass Company became effective in March. By this arrangement Graybar assumes the distribution of O-B low-voltage insulators and hardware for distribution and farm lines. In addition, Graybar handles the entire O-B insulator line for R. E. A. and municipal use.

Ohio Brass Company is one of the largest manufacturers of overhead materials and other electrical equipment.

# AIR CIRCULATING *and cooling* EQUIPMENT



*R. & M. BANNER Fans, by Robbins & Myers, Inc., Springfield, Ohio.*

## *Advertisers In This Section:*

American Blower Corp.

American Coolair Corp.

Autovent Fan & Blower Co.

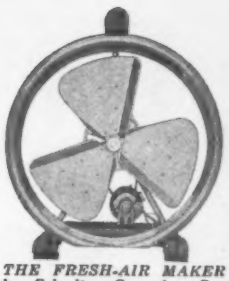
Buffalo Forge Co.

Hunter Fan & Ventilating Co., Inc.

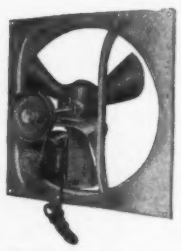
Robbins & Myers, Inc.

Schwitzer-Cummins Co.

Signal Electric Mfg. Co.

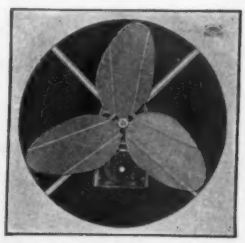


*THE FRESH-AIR MAKER by Schwitzer-Cummins Co., Indianapolis, Ind.*

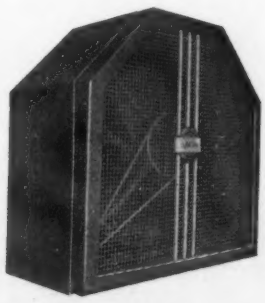


*BUFFALO Breez-Air Cooling Fans, by Buffalo Forge Company, Buffalo, N. Y.*

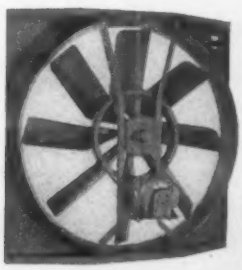
*SIGNAL'S Deluxe Streamliner. Signal Electric Mfg. Co., Menominee, Mich.*



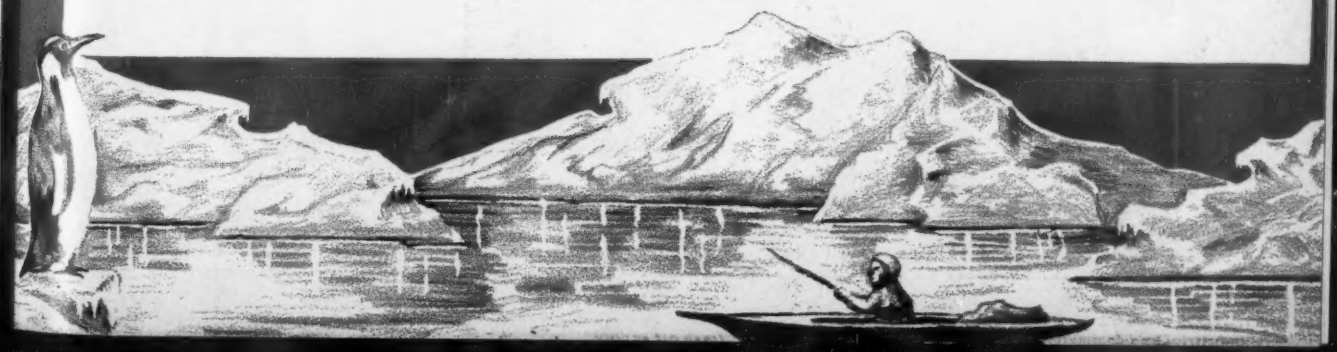
*AUTOVENT'S COOLVENT Attic Fan by Autovent Fan & Blower Co., Chicago, Ill.*



*VENTURA Home Conditioner by American Blower Corp., Detroit, Michigan.*

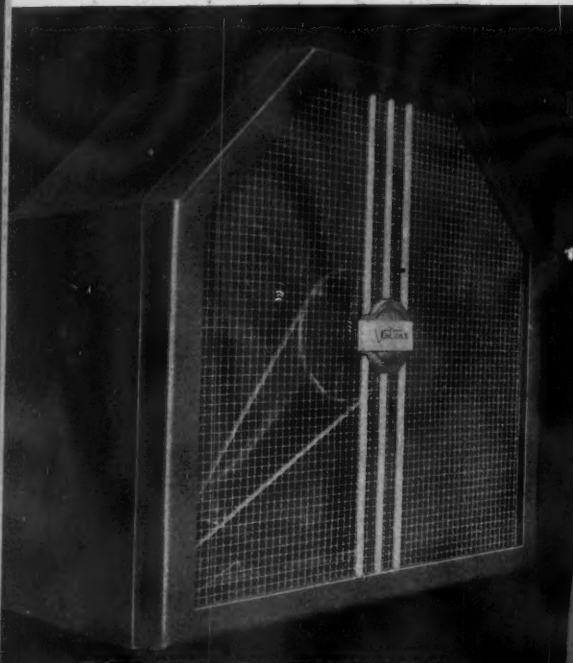


*COOLAIR Attic Fan by American Coolair Corp., Jacksonville, Fla.*

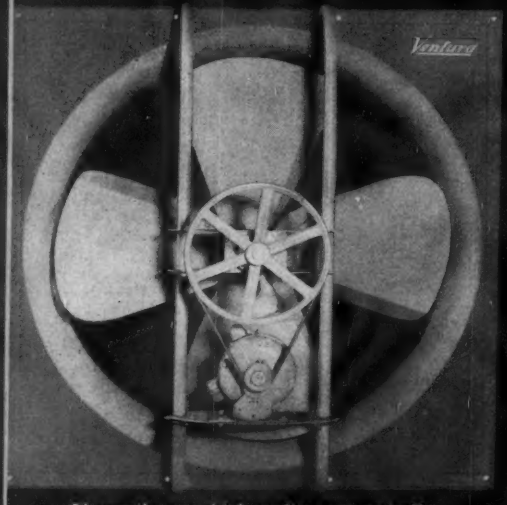


# The PROFITS in Comfort Cooling will

POP



*Famous Ventura Home Conditioner (Attic Fan), above. Thousands are now in use.*




*Above—the new, high quality, economically priced Ventura Attic Fan—greatest value in American Blower history.*

**Are you making money?**

**With your present business, even if you work your head off, can you make anything more than just a living?**

**Have you investigated the profit possibilities in Comfort Cooling with American Blower equipment?**

**The American Blower line is the most complete in the industry. It enables a dealer to sell homes, factories, commercial establishments, restaurants, offices, etc., products that they need and want.**

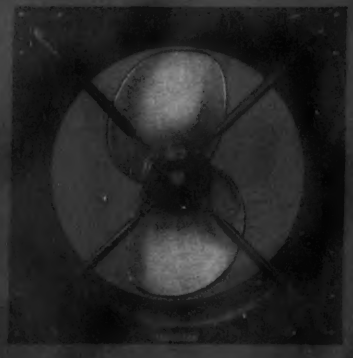
**There are no trade-ins or complicated service problems to cut into your profits. It's a clean business, a real business, for real business men.**

**If you want to build for the future, if you want to insure your profits next year, the year after, and for as many years as you care to be in business, let us give you the facts on what can be done. Let us show you what dealers have made and are making selling American Blower equipment. Write today. There is no obligation. This may be the biggest opportunity in your life. The profit possibilities of this line will pop your hat off.**

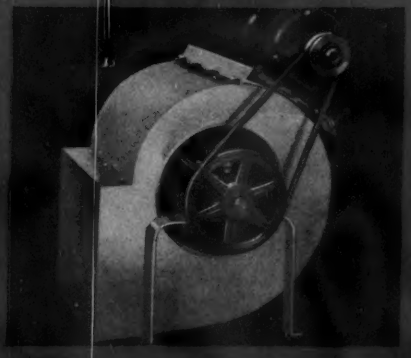
## AMERICAN BLOWER

AMERICAN BLOWER CORP., 6000 RUSSELL ST., DETROIT, MICH.
*Division of American Radiator and Standard Sanitary Corporation*
In Canada: CANADIAN BLOWER & SIROCCO CO., LTD., Windsor, Ont.

*You can sell American Blower Products on F.H.A. Pay-By-The-Month Plan through The Heating & Plumbing Finance Corporation*

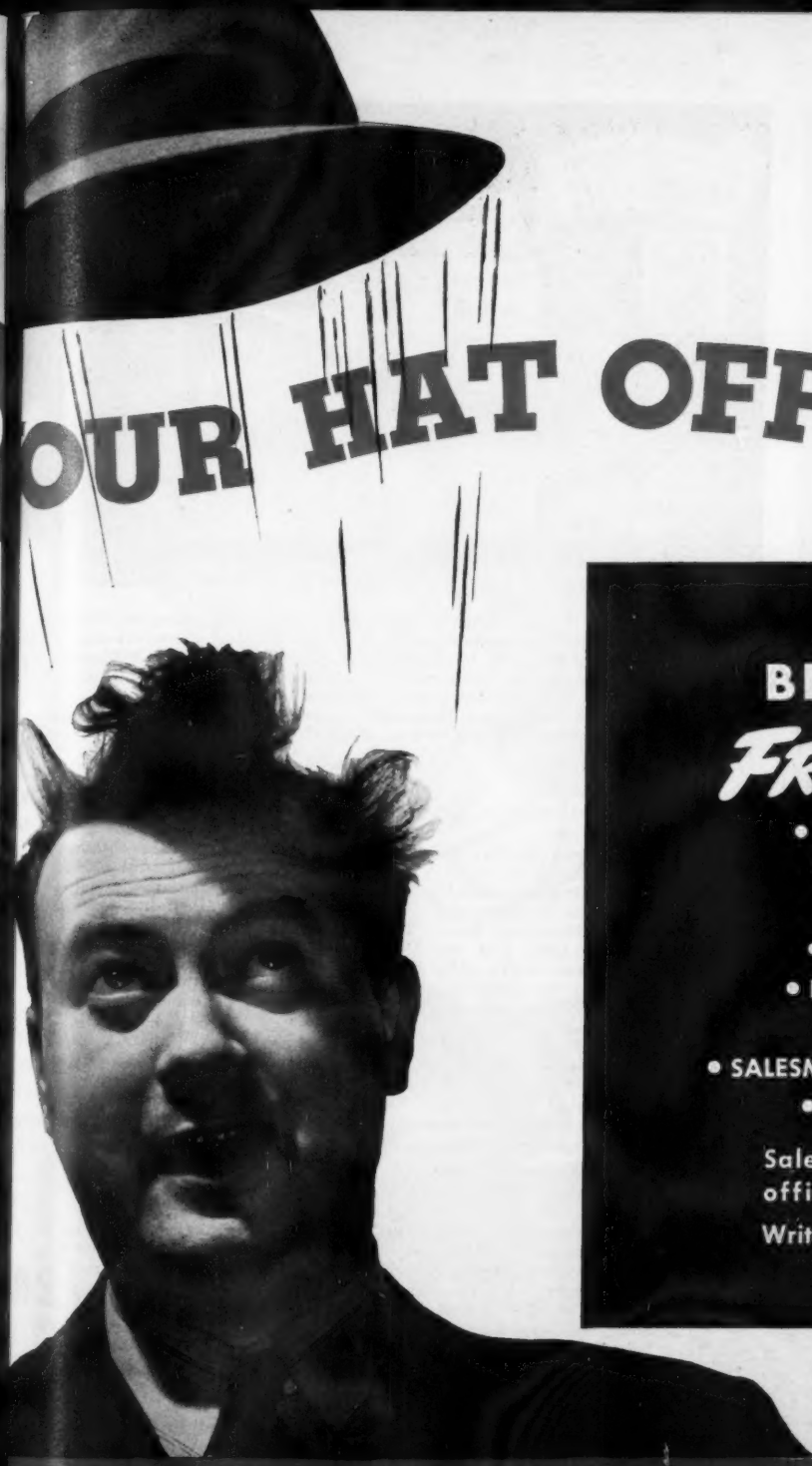


*Ventura Fan, direct connected, for*



*The AC Fan, for air conditioning work and*

*Commercial Ventura Fan, V-Belt Drive*



# OUR HAT OFF!

## BIGGER—BETTER FREE PROMOTION!

- COLORFUL SALES VISUALIZER
- NEWSPAPER ADVERTISING
- MAGAZINE ADVERTISING
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- NEWSPAPER AD MAT SERVICE
- ARCHITECTS' CATALOGS
- SALESMEN'S CATALOGS AND PRICE BOOKS
- AUTHORIZED DEALER SIGNS

Sales assistance through 58 branch offices located in principal cities.

Write for copy of our sales plans NOW!

**American Blower's reputation** for high quality is backed by over 60 years' experience building all types of ventilating, heating, air conditioning and allied equipment Over 58 branch offices in principal cities.

MECH. DRAFT · AIR-CONDITIONING
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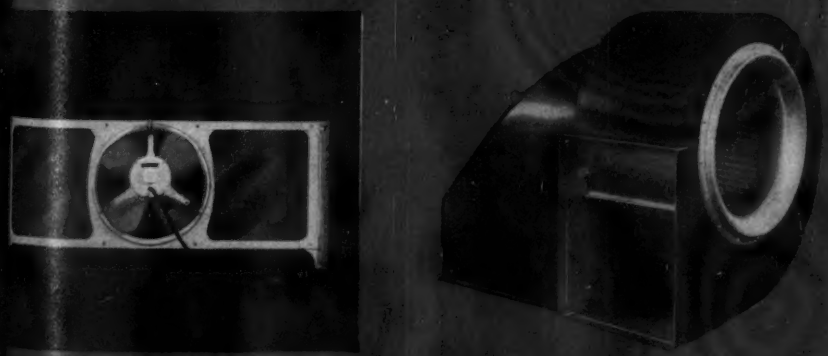
FLUID DRIVES · DUST COLLECTORS



ABC Utility Set, a complete, packaged unit for use with ducts.

NOW—TODAY! . . . Line yourself up with the greatest, most complete line of Comfort Cooling and Electric Ventilation products ever offered by American Blower . . . All top quality products, nationally advertised, nationally known. Any aggressive, intelligent concern can organize for year-round, successful sales and service of this complete line for homes, stores and industries within a few weeks. But the peak season is not far off! Act now!

## Hotpoint's Millionth Range Keynote of Campaign Plan

Anticipating production of Hotpoint Electric Range No. 1,000,000, the Hotpoint Range Sales Division prepared a complete plan of merchandising, advertising, and publicity, commemorating the Millionth Hotpoint Range. This plan, according to Ward Schafer, Hotpoint Range Division Manager, will enable Hotpoint retailers to capitalize on the prestige which must accrue to them, as representatives, in their communities, of the first manufacturer to produce one million electric ranges.

Hotpoint will announce production of the One-Millionth Hotpoint Electric Range to the public in a full-page advertisement in gold, scheduled for the April 28 issue of **Life** Magazine.

The actual One-Millionth Hotpoint Electric Range, a 1941 Aristocrat Model equipped with special 24-karat gold hardware and trim, was produced March 24, 1941. It has been donated to the Ford-endowed Greenfield Museum, Greenfield. Michigan, where it will rest alongside the first practical electric range, which was made in 1910 by George A. Hughes, now Chairman of The Hotpoint Company. A number of exact replicas, including gold trim, have been produced for itinerant display, and 24-karat gold "Hotpoint" nameplates, duplicating the one in the original Millionth model, have been made available for other Hotpoint Aristocrat models. These specially-trimmed models form the nucleus of the retail activity, "Commemorating the One-Millionth Hotpoint Electric Range." Wide blue ribbon bands, printed in gold with the words, "Commemorating the One-Millionth Hotpoint Electric Range," will supplement the special window and store display backgrounds which Hotpoint has made available to retailers for this activity. One special background pictures the progress of Hotpoint electric ranges from 1910 (when Mr. Hughes made the first one) to the present.

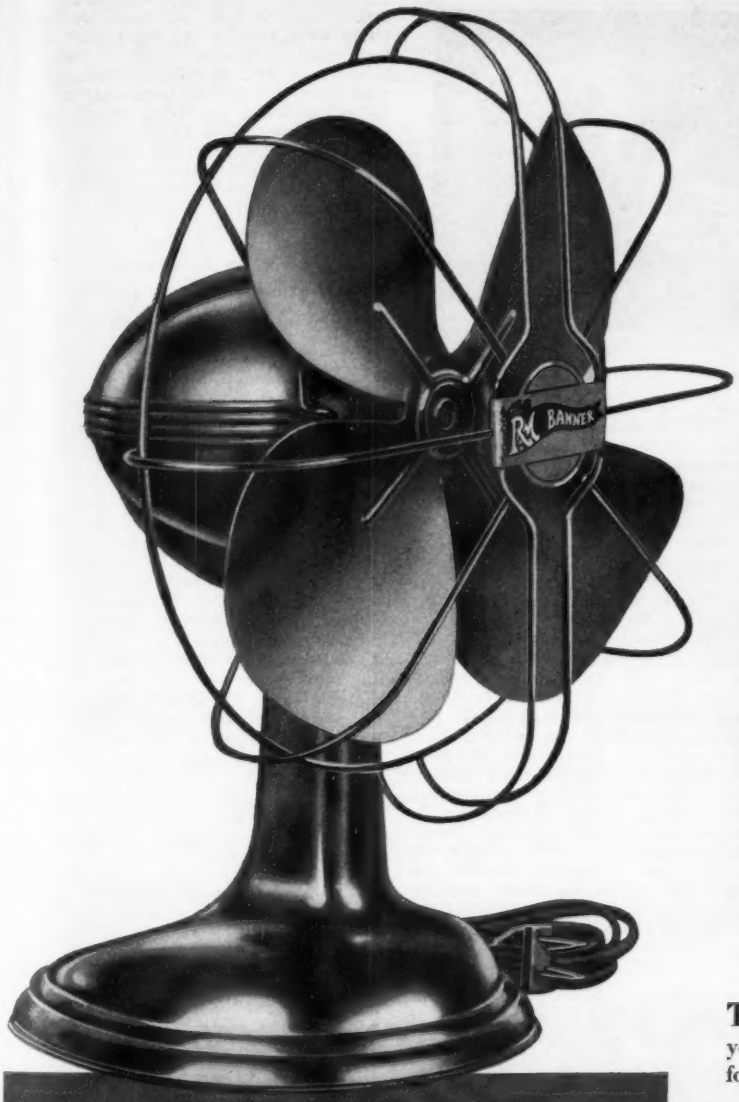
**A special window display, tracing Hotpoint electric range progress from 1910 (when George A. Hughes made the first practical electric range) to the present, to be used by Hotpoint retailers during the Millionth Hotpoint Range Commemoration activity. Another special deluxe display made available by Hotpoint for window or store-use is designed to set off a replica of the One-Millionth Hotpoint electric range, during the retail activity commemorating production of Hotpoint's millionth range.**

Hotpoint has prepared special invitation mailing pieces, which retailers may use for inviting the public to visit their stores to inspect the beautiful replica of Hotpoint Electric Range No. 1,000,000, and receive a special commemorative gift. The gift, made available by Hotpoint, is a handsome, colorful, "Around-the-Calandar" Meal-Planner, publicizing the commemoration of the Millionth Hotpoint Electric Range and containing helpful menus for every season, with recipes compiled by the Hotpoint Home Economics Department.

During the Commemoration activity, retailers and salesmen, as well as Hotpoint distributor and field organization members, will wear gold-colored lapel buttons, also commemorating the Millionth Hotpoint Range. Other sales and merchandising helps, made available by Hotpoint for the Millionth Hotpoint Range Commemoration activity, include newspaper-type handbills, with coupons containing special Meal-Planner gift offer; specially-planned newspaper advertising mats; a special 24-sheet billboard poster; new consumer folders featuring the full Hotpoint Home Appliance Line, and special recorded radio spot announcements.

Retailers are being advised of Hotpoint's complete plans for commemorating the One-Millionth Hotpoint

**To commemorate the One-Millionth Hotpoint electric range, Hotpoint has worked out a complete plan whereby Hotpoint retailers may clearly identify themselves with this outstanding achievement. Examining one of the special advertisements prepared for this activity, left to right: G. H. Smith, general merchandising manager; R. W. Turnbull, vice-president; Ward Schafer, range sales division manager; A. D. Byler, president, and W. A. Grove, advertising and sales promotion manager. Below, the millionth Hotpoint range rolls off the production line.**




# FOR A "BANNER" SEASON

## Sell R&M BANNER FANS

BACKED BY POWERFUL SALES HELPS AND NATIONAL MAGAZINE CAMPAIGN

**$9.95 Retail** 10-INCH OSCILLATING

12-INCH OSCILLATING . . . . . $17.95 RETAIL

8-INCH NON-OSCILLATING . . . . . $3.95 RETAIL

Up-to-the-minute streamlining . . . powerful, oversize R & M motors . . . fully enclosed mechanism . . . precision-built gears and bearings . . . broad, quiet, vibration-free blades . . . stunning rich, brown finish . . . fully guaranteed for one year!

The new R & M Banner fan line will make your store summer-comfort headquarters . . . for both old and new customers.

More than 21 million advertising messages in The Saturday Evening Post, Time and Business Week go to work for you while the weather is hot and sales are hotter . . . with increased employment, bigger payrolls giving buyers more money to spend for home comforts. Powerful R & M display and direct selling helps are geared to give you the biggest fan sales season you ever enjoyed.

And, remember, R & M has fans for every purpose . . . to fit the needs of *every* customer, priced from $3.95 for the 8-inch Banner fan to $190.00 for a big exhaust fan.

Get the whole profitable story told in the new, attractively illustrated R & M 1941 Fan Catalog showing the *complete* line. Write now.

## ROBBINS & MYERS • Inc.

FAN DIVISION • SPRINGFIELD, OHIO

Range through a trade announcement broadside, containing complete information, and through personal calls by Hotpoint wholesale distributor representatives. These representatives have been provided with 20-page presentation books, printed in gold, black and red, containing full details and suggestions for helping the retailer tie-in locally with Hotpoint's national publicity and advertising on the Millionth Hotpoint Range.

Most Hotpoint retailers will write personal letters to prospects, supplementing the Invitation mailing-piece, and urging them to attend the special events planned to Commemorate the Millionth Hotpoint Range. Special store decorations and cooking schools, together with special showings of Hotpoint's motion picture, "Blame It On Love," and the new Hotpoint historical film, "—And the Pursuit of Happiness," are some of the activities planned by retailers.

## New G-E Polyphase Motor Has Protective Features

As a result of a broad survey of the changing requirements of its industrial customers, General Electric announces an entire line of completely new polyphase induction motors, in integral horsepower sizes, to conform with new industrial trends, processes, and practices. Known as the Tri-Clad motor and representing one of the most extensive product changes in the history of the company, it has called for many new methods in G-E motor manufacturing.

In all its ratings, it features modern streamlined appearance; more

complete protection—through the use of a cast-iorn frame—than heretofore available except in especially enclosed machines; major advances in the insulation of current-carrying parts; and improved bearing design and lubricating arrangements. At the same time, it incorporates the cast-aluminum rotor, pressure-relief system of greasing for ball-bearing motors, and other proven features. In addition, however, it offers many new convenience features.

In recent years there has been an increasing and widespread demand for more protective features in open, general-purpose motors. Thus, despite its striking modern appearance, major industrial interest in the new G-E motor will undoubtedly center around its outstanding mechanical and electrical protective features. In place of the conventional open frame, it makes use of a cast-iron frame of the box type. The end shields are designed to match the frame and are enclosed above the centerline. This combination of frame and end shields minimizes contact of vital motor parts with foreign material such as lubricants, coolants, and other liquids, as well as chips, tacks, etc., while also protecting it against accidental blows in handling or similar rough usage. The new-type insulation, dust-tight bearings, and the use of Glyptal in the priming and finishing paints armor it against the attack of harmful agents.

## Johns-Manville Announces New Industrial Catalog

Transite electrical conduit and Korduct, Asbestos Ebony, and other J-M electrical materials are described in considerable detail in the new 1941 edition of the Johns-Manville Industrial Products Catalog now available. This 52-page, illustrated book contains a wealth of information and recommendations on high and low temperature insulations for every industrial need from 400 deg. F. below zero to 2500 deg. F. above.

Complete data are also included on J-M refractory products and castables; specifications on J-M Bonded Asbestos Built-up roofs and J-M insulated roofs; detailed information on J. M. Corrugated Transite for roofing and siding; on J-M industral friction materials; on Transite Pressure pipe for industrial and municipal water lines; on Transite industrial vent pipe and stacks; and on J-M packings and gaskets.

The catalog also describes in detail J-M Industrial Flooring Plank, Asphalt Tile flooring and Transite movable partitions.

Copies of this book, Form GI-6A, are available upon request to Johns-Manville, 22 East 40th Street, New York City.

**W. J. Russell, manager of engineering at Westinghouse's merchandising plant, Mansfield, Ohio, explains that the new "Laundromat" automatic cycle washer gives washed clothes a final spin at 500 rpm for three minutes extracting 87 per cent of the water. Stanley Fisher, (center) marketing manager who will introduce the new automatic, and Frank R. Kohnstamm, (right), Westinghouse merchandising sales manager, seem pretty pleased about the whole thing.**

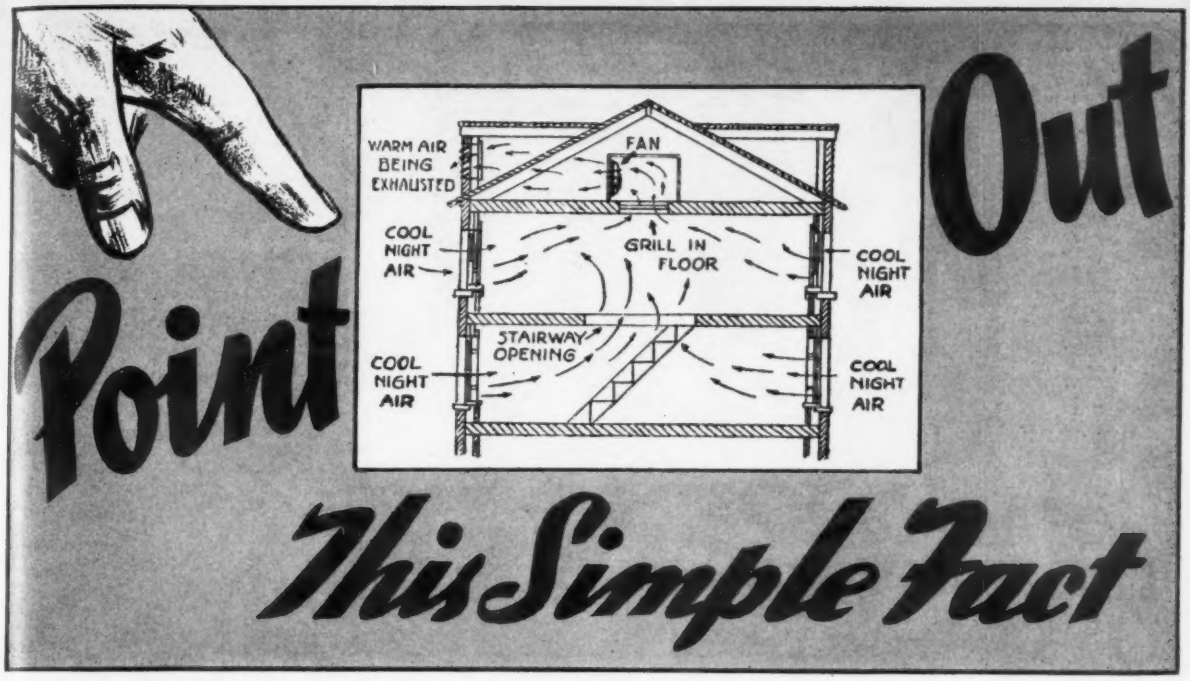
## Many Innovations in New Norge Ro-Ta-Tor Washers

As new and advanced inwardly as its complete outward restyling would indicate, the new 1941 line of Norge Ro-ta-tor washers come forward with a host of new features to help the housewife get cleaner, whiter clothes with less effort and no "wash-wear."

Among the outstanding advantages offered by the new Ro-ta-tor washers are: Roll-Around washing action; new Damp-Dryer; safety pressure release; new streamlined wringer head with machine-cut steel gears; double safety interlock; Norcelain finished drainboard; one-piece heavy steel tub, porcelain finish; Ro-ta-tor lock cap and automatic lifter; feather-weight plastic Ro-ta-tor; self-draining tub bottom; live rubber tub cushion; heavy-duty ¼ H. P. motor and simplified oil-proofed transmission.

Five electric models, and three gasoline powered models, offer complete coverage of the entire price field. An electric motor cradle is provided with all gas-powered models so that electric power may be installed at a later date. Installation of the new motor may be made using only a wrench and screwdriver.

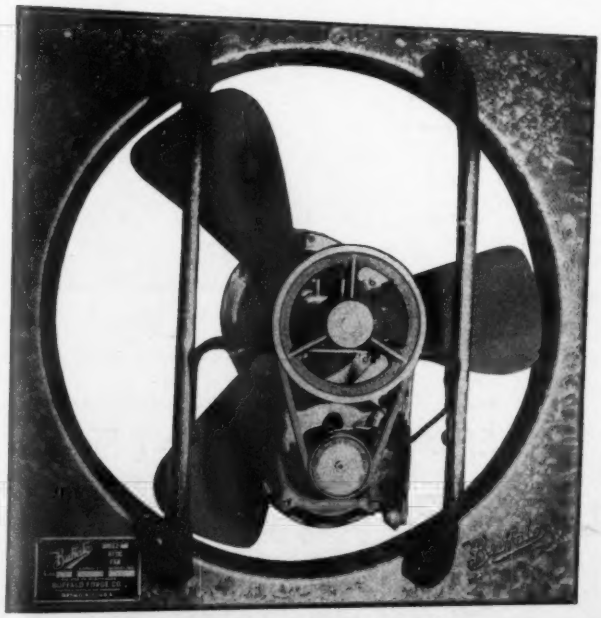
Heart of the new Norge washers is the Ro-ta-tor itself, a satin-smooth




## THEN... Watch How Fast Prospects Become Customers

It doesn't take high-pressure salesmanship to prove the logic of *Breez-Air* home cooling! Here's one of the easiest-to-sell ideas that ever hit the market!

Note the simple arrangement shown above. Here's summer comfort at the lowest possible cost. A quiet, efficient *Breez-Air* Fan is installed in the attic. Operated after sundown, it pushes out the accumulated hot air, draws in cool night air—provides modern cooling throughout the sultry summer months.

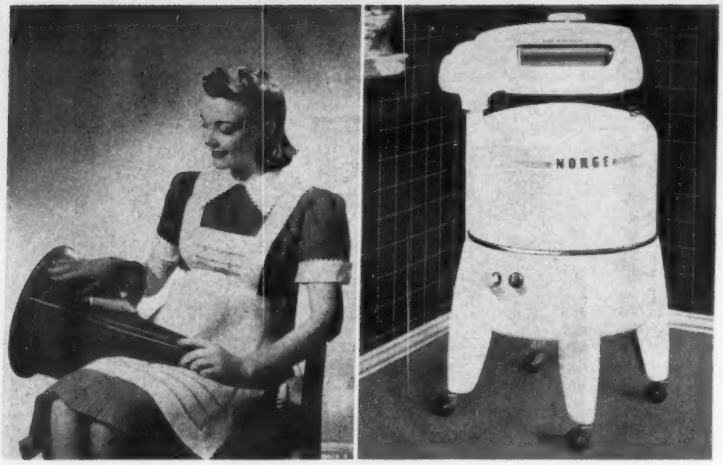


When you recommend a Buffalo *Breez-Air* Fan for the job you're sure to make a hit with the customer. *Breez-Air* Fans are silent in operation, economical to run, and practically never need attention.

Active sales ahead! Better get started on this popular home cooling idea *right now.* Write or wire for full details.

**BUFFALO FORGE COMPANY**
210 Mortimer St. Buffalo, N. Y.

**"Buffalo" BREEZ-AIR FAN**
***The Quality Home Cooling Fan***




**This is Model W-5 which leads the new line of Norge washers. Sixty pounds of clothes per hour can be washed in this model having 20-gallon water capacity. The smoothness of the plastic Ro-ta-tor is being demonstrated by the young lady—delicate silk stockings can be rubbed up and down its surface without danger of runs.**

plastic part which replaces the former-type metal "agitator". Weighing but half as much as the lightest metal agitator, the Ro-ta-tor is easily and quickly removable, by the simple turning of a lock-cap, so that it may be readily washed and replaced.

Proof of the smoothness of the Ro-ta-tor surface is dramatically made by a "silk stocking test", which consists of rubbing a sheer silk hose up and down along one of the edges of the Ro-ta-tor. No run has even been produced in thousands of tests of this kind! The severity of the test is even more apparent when account is taken of the fact that the trial is made on a dry Ro-ta-tor, without benefit of the lubricating action of sudsy water found under actual washing conditions.

No less important a feature of the new Norge Ro-ta-tor washer is the Roll-Around action imparted to clothes. Gentle, but lively, is the washing action in these new machines. Clothes are not moved sluggishly about, not allowed to lie lazily at top or bottom of tub, or to lodge within the vanes of the Ro-ta-tor.

Instead, the entire batch of washing is gently guided into an over-and under, under-and-over cycle, at the same time being moved around the tub in a constant Roll-Around action. Checks with colored cloth "tracers" in white batches of clothes reveal that the same pieces in the machine rise to the surface from 4 to 6 times a minute, and every time in a different place. They really get around!

## News About People

Announcement has been made by the National Adequate Wiring Bureau of the appointment of **Victor R. Despard,** vice president of Pass & Seymour, Inc., to the Executive Committee.

Upon undertaking his new duties as a member of the Executive Committee, Mr. Despard issued the following statement:

"Having gone over the 1940 program of the National Adequate Wiring Bureau, I am convinced that the electrical industry will accomplish surprising results—if its promotion material, as well as personnel, is utilized to the fullest extent.

"Those of us in this industry should, whenever the occasion requires, talk adequate wiring, explain what it means not only to our industry, but to the comfort and convenience of the public. Comfort and convenience are two things the public will understand.

"I believe we have been too timid in setting up minimum specifications. We have a stronger claim for more of the house-dollar than most things the public buys. Even one fine piece of furniture costs more than a good complete wiring job with all the comforts and conveniences electricity offers 24 hours a day."

Mr. Despard, who is familiarly known as "Vic" to practically the entire electrical industry, has had wide experience in most branches of the industry and is enthusiastic in his desire to help sell the adequate wiring idea to the public.

* * *

Appointment of **D. S. Gray** as headquarters supervisor of utility sales is announced by **F. R. Kohnstamm,** sales manager of the Westinghouse Merchandising Division, Mansfield, Ohio. Mr. Gray succeeds

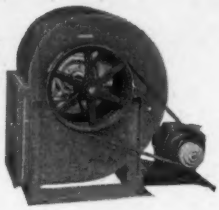
**D. S. Gray**

COOLVENT
ATTIC VENTILATION
*Supplied Through Recommended Trade Channels, Only*
Built of steel for lasting satisfactory service
*Distributed all over the South*
AUTOVENT FAN & BLOWER CO.
1825-27 N. Kostner Ave., Chicago, Ill.
CERTIFIED RATINGS
MEMBER OF NAFM

KEEP YOUR VIEWPOINT FRESH!
Every year is a "New Era".
Constant change—something new—something better—is a characteristic of America.
The easiest way to keep up to date in the electrical trade is through the pages of your business magazine. ELECTRICAL SOUTH gives you each month information, ideas, plans and suggestions based on the intimate contact of our editorial staff with the most successful electrical merchandisers over the South.
If you are not already a subscriber, send in your $1.00 today for a yearly subscription or $2.00 for three years. Extra postage on subscriptions to Canada, 50c per year; Foreign, $1.00 per year.
ELECTRICAL SOUTH
GRANT BUILDING
ATLANTA, GEORGIA

## YOUR BLOWER REQUIREMENTS

*available at*
**Schwitzer-Cummins Company**



**● BLOWERS FOR EVERY PURPOSE**
HY-DUTY Blowers, 9¾" to 25".
Top and Bottom Horizontal, and Top and Bottom Vertical Discharge.
Top and Bottom Motor Mounting.
Dual Units also available.

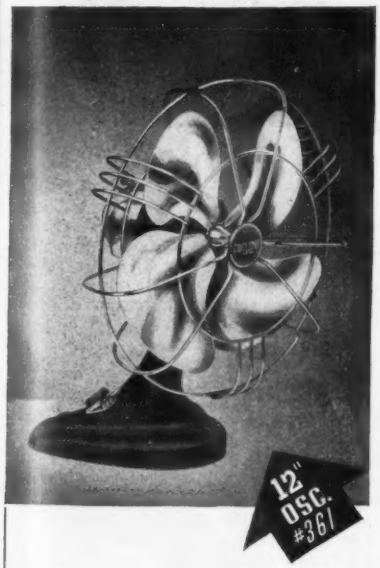
**● CENTER DISC WHEEL**
Double Inlet, Double Width.
Reinforced Center Disc.
Designed for Modern Air Conditioning and Heating Applications.
Sizes, 4½" to 50".

**● SINGLE INLET WHEELS**
For Oil Burner, Stoker, and Air Conditioning Applications.
Sizes, 4½" to 50".
Variety of Blade Lengths for each diameter.

**● ENGINEERING DATA**
Write for catalogues showing complete Performance Data.
Experienced Engineering Department available to help solve your Air Handling Problems.

BLOWER DIVISION
SCHWITZER-CUMMINS COMPANY
125 FAN STREET INDIANAPOLIS, U. S. A.






Signal's 1941 fans embody the ultimate in Design-Quality-Price. Each fan is generously endowed with the eye appeal that commands attention, with important features that rate them real values. And, all are in the popular price brackets. See your jobber now!

## SIGNAL ELECTRIC MFG. CO.
MENOMINEE, MICHIGAN

*Branch Offices:*
*W. E. Hopper*
*857-59 Marietta St., Atlanta, Ga.*
*Geo. E. Anderson*
*Sante Fe Bldg., Dallas, Texas*

SIGNAL



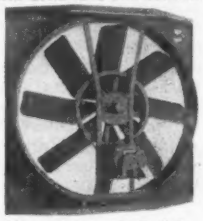
*There are* **3 Vital Profit Points** *in the oil heating and electrical business and* **Coolair Attic Fans** *are TOPS in ALL 3!*

. . . says Mr. Lewis S. Doherty, president of Doherty-Stirling, Inc., Baton Rouge, La., one of the South's most progressive heating equipment and electrical appliance distributors.

"In our line of business," explains Mr. Doherty, "profits depend on three main essentials: (1) the quick difference in cost and selling price when the job is completed: (2) cost of service and adjustments during and after the customer warranty; and (3) the good will created by selling and properly installing quality equipment. We believe that Coolair attic fans meet these requirements better than any other make."

Mr. Doherty adds that for heating organizations in particular, the Coolair fan business is ideal to fill the need for summer profits.

If you want to make real profits with attic fans this summer, find out how Coolair meets the "three vital profit-points" with liberal discounts to dealers and a quality fan line that eliminates costly service calls and wins customer good will. Coolair fans are made and guaranteed by the pioneer manufacturer in the home-cooling field with more than 13 years' engineering and sales experience at your service.



New, improved Coolair Home-Cooling Fan; all-steel construction, patented sound-absorbing springs, streamlined inlet.

New Coolair Attic Package, complete with fan and automatic ceiling shutter, greatly simplifies installation.

FREE illustrated catalogs, direct mail pieces, local newspaper ad mats and other sales helps are ready for you. Write today for details and franchise information.

## MAIL THIS COUPON TODAY!

American Coolair Corporation,
Jacksonville, Florida

Please send me information on the complete line of Coolair fans.

Name _____

Address _____

City _____ State _____

Coolair Ventilating and Cooling Systems
AMERICAN COOLAIR CORPORATION
Manufacturers . . . . JACKSONVILLE, FLORIDA

**A number of prominent Atlanta wholesale executives were guests of the Southeastern Electrical Manufacturers' Representatives Club at a dinner meeting held recently in the Piedmont Hotel. Principal feature of the program was a talk by Commander Jesse Draper on "The Training of a Two-Ocean Navy Personnel." At the speaker's table, standing, from left to right, are V. H. Branham, R. W. Collins, secretary of the club, Mr. Draper, and C. W. Chapman, vice president, who presided. C. C. Schoen, president of S.E.M.R.C., was unable to attend because of an illness. Next meeting of the club will take place April 29.**

**W. H. Thompson** who has been named utility sales manager of the Westinghouse Lamp Division, with headquarters in Pittsburg, Pa.

Mr. Gray, a native of Columbus, Ohio, and graduate of Princeton University, joined Westinghouse in 1937 at Mansfield as range and water heater supervisor for the central sales district. In 1938, Mr. Gray became manager of Westinghouse water heater sales and later that year, Eastern regional supervisor of the Range and Water Heater Department. He went to New York in 1939 as supervisor of Merchandising Division activities in the Westinghouse World's Fair exhibit.

* * *

According to an announcement by **C. M. Snyder,** assistant manager of the G-E Appliance and Merchandise Department, Bridgeport, Conn., **B. C. Bowe** has been appointed manager of department store sales, effective at once. Mr. Bowe has had more than 11 years of experience in contacting department and furniture stores, and is well-known in this particular market. He has been manager of appliance sales for General Electric in the St. Louis territory since 1938.

In his new post, it will be his particular objective to develop business in the full line of appliances, working with department and furniture stores nationally to become better acquainted with their problems and aims.

Mr. Bowe joined General Electric in 1909, working in the lamp sales section and as a Tungar specialist. In 1924 he was appointed manager of Tungar sales, and when the radio sales section was formed in 1930, he became radio sales manager. In 1936 he was transferred to St. Louis as district radio sales manager, and in 1938 became district appliance sales manager.

**B. C. Bowe**

* * *

**Edward Robie Grier,** chairman of the board of the Arrow-Hart and Hegeman Electric Company, of Hartford, Conn., died suddenly on February 11, 1941, at the Fort Sumter Hotel, Charleston, S. C., while motoring to Miami.

Mr. Grier was born at Mount Joy, Pa., Sept. 1, 1869. One of his ancestors was head of the Indian bureau in the province of Pennsylvania and another a colonel in the French and Indian war.

He was educated in Philadelphia schools and became an apprentice at the Baldwin Locomotive Works. In 1887 he became an electrical tester at the Marr Construction Company, of Columbus, Ohio, and was later in charge of the electric light of the Hoosac Tunnel. In 1895, he was manager for the Bryant Electric Company, of Bridgeport, and later formed a partnership of Hubbell and Grier Company, of Bridgeport.

He came to Hartford in 1906 and took over the management of the Arrow Electric Company in 1908. Since 1927, when the Arrow Electric Company was merged with the Hart and Hegeman Manufacturing Company, he had been chairman of the board of directors.

**Edward R. Grier**

* * *

**D. O. Scott,** president of Bendix Home Appliances, Inc., announced today that **Thomas J. Litle, Jr.** has been appointed director of engineering for the company. Mr. Litle will be charged with design, development, and research work, and the correlation of engineering and mannfacturing facilities.

Mr. Litle comes to Bendix Home Appliances from the Easy Washing Machine Company, where for four years, he was chief engineering executive. Earlier in Mr. Litle's career, he was director of engineering and production with the Lincoln Motor Car Company, and during the first world war, collaborated with Packard, Ford and Cadillac in the development work, and production of the Liberty motor, under Government direction.

LIBERTY LIFE BUILDING, COLUMBIA, S. C.

# *Completely rewired with Flamenol**

## BUILDING WIRE

**110,000 FEET OF FLAMENOL USED INCLUDING**
**15,000 FEET OF NO. 4 • 5,000 FEET OF NO. 6**
**70,000 FEET OF NO. 12 • 20,000 FEET OF NO. 14**

Now lights burn as brightly in the Liberty Life Building in Columbia, South Carolina, as in any newly erected building of similar type. Increased wattages were made possible by complete rewiring with Flamenol Building Wire. The old feeders, subfeeders and branch circuit wires were pulled from the conduits and replaced with larger Flamenol wires or more Flamenol wires.

Although the building was still young, the Liberty Life Insurance Co., owners of the building, decided that the wiring system had become inadequate. This, of course, has happened to thousands of other office buildings. Electrical progress has been so rapid that no one could have foreseen today's requirements.

Modernization of the Liberty Life Building's wiring with small diameter building wire was decided upon by W. T. Love and Company, manager of the building, in consultation with G. H. Preacher of the South Carolina Electric and Gas Company. Jordan Electric Company of Columbia, S.C., made the installation. Other G-E materials used, in addition to Flamenol, included switches, and conduit and wire for new elevator wiring.

*Reg. U.S. Pat. Off.

### FLAMENOL BUILDING WIRE

Flamenol small diameter building wire is a new type wire for rewiring existing raceways. It is insulated with a plasticized polyvinyl chloride compound. No braid is required. It is available in sizes 14 to 4/0 inclusive.

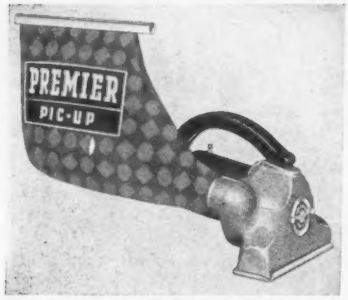
For further information on Flamenol Building Wire and for samples see the nearest G-E Merchandise Distributor or write to Section W-1164, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

**GENERAL ELECTRIC**

# New Products

### Premier Hand Cleaner

One of the popular new models in the Premier 1941 line which created so much interest at the recent Major Appliance Show is this smartly designed Model 52 Hand Cleaner. Completely new in styling, this maroon-and-gray cleaner has a patented sa-




teen dust bag which harmonizes in color with the durable crinkle finish of the nozzle and housing. The cleaner's Hi-Power motor is ball-bearing and so is its efficient motor-driven brush. This new, lightweight yet sturdy cleaner is operated by a fingertip switch.

### Wagner Kitchen Fan

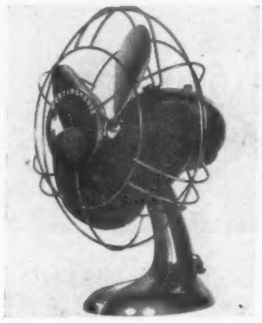
New type kitchen wall box ventilator, adjustable for wall thicknesses 5¼" to 13", with inside grill finished in white enamel, is announced by Wagner Electric Corporation. Door on outside opens by spring tension when ball-chain is released. Fan starts and stops automatically with opening and closing of door.

Also available is a new window ventilator. Panel is adjustable from 23" to 36". Single speed, 10-inch, delivers 560 CFM. Quiet-type blades, induction type motor. Both fans are fully described in catalog FU-41. Write to Wagner Electric Corporation, 6400 Plymouth Avenue, St. Louis, Mo.

### New Electric Fans

A price reduction of $3.00 in the retail price of the leading model of the line was announced recently by the Westinghouse Merchandising Division in introducing the 1941 line of Westinghouse household electric fans.

The 10-inch Power-Aire, illustrated here, an oscillating desk model with non-resonant Micarta blades, this year carries a suggested retail price of $14.95, three dollars less than the similar 10-inch last year. The new fan has a three-speed snap type switch and has an oscillation arc of either 75 or 45 degrees. Its air de-



livery is 1000 cubic feet per minute.

The 10-inch Pacemaker oscillating desk-bracket fans, has one-piece steel blades, a rotary off and on switch, and is priced at $9.95.

All models of the line have completely new styling, the Pacemaker models being finished in mahogany brown, and the Power-Aire models in gunmetal gray. Other models, in addition to the two 10-inch fans, are the 8-inch Pacemaker, a non-oscillating desk fan priced at $4.95; the 10-inch Pacemaker on a pedestal, $12.95; the 12-inch Pacemaker at $17.95; and the same model mounted on a pedestal, at $22.45.

### Victor Fan Catalog

Holding to the theory that a catalog should be as attractive as its contents are in reality, Victor Electric Products, Inc., Cincinnati, Ohio, has just published a new 12-page, two-color catalog illustrating their complete line of "Miracle Breeze" fans. It is designed to serve as a presentation booklet and manual for Victor salesmen and jobbers.

It includes the two newest Victor fans—the 8-inch Vogue for the home market, and the Revolaire, a ceiling fan fixture for large rooms. It is 8½"x11" in size and has a bright and attractive orange and grey color motif that is carried throughout the 12 pages. There is no crowding of either illustration or copy. The entire presentation is readable and easy on the eye.

### New Reflector Spot Lamp

To supply show window and other lighting display needs, new 200-watt reflector spot and flood lamps have just been announced by the commercial engineering department of the

## Contractors Propose Southeastern Council

(*Continued from page 24-A*)

sumption per family in this area has increased to about 1425 kwh per year while the average consumption in the United States is 925 kwh.

"This is an important factor in the increase of farm electrification from three per cent of the farms in 1934 to 15 per cent in 1939. This constructive work has gone on two and a half times as fast in the Tennessee Valley area as in the United States as a whole.

"The revenue received by the TVA from farms has increased from $180,000 in 1937 to $1,800,000 in 1940.

"The same trend has taken place in the sale of electrical apliances in this area. In the four states of Alabama, Georgia, Mississippi and Tennessee, the increase has been 293 per cent since 1935, as compared with 117 per cent increase in the rest of the United States. In the immediate area where the TVA rates are in effect, the increase in residential appliance sales was 800 per cent from 1935 to 1939.

"In the year 1940 the average sale per capita in this area was $46, as compared to $35 in the whole United States. Had every person in the United States bought as much electrical appliances as he did in the Tennesee Valley, sales of such appliances would have been increased by $264,000,000."

Hal M. Horton, lighting engineer, General Electric Lamp Division, was a speaker at the second day's session. He pointed out that the best lighting available was under a tree on a sunny day, approximately 1,000 foot-candles of light falling on any surface there. He said that in striving to duplicate the same conditions great advances had been made in the last few years, especially by use of fluorescent lighting which eliminated glare. However, he said, the best inside lighting still falls far short of "the shade tree idea," particularly in intensity of light produced. Interior lighting, he said, rarely was higher than 100 foot-candles, as compared with 1,000 foot-candles under the tree. He used a number of lantern slides, both in black and white and in color, showing types of lighting and advantages.

Harvey G. Meyer, professor of accounting at the University of Tennessee, Knoxville, discussed the value of accountancy to electrical contractors. "Accounting systems," he said, "should provide the complete and reliable data necessary for intelligent management. It should provide it in sufficient detail and should provide it promptly. Precise information is particularly valuable in a time of change."

# SOUTH CAROLINA PUBLIC SERVICE AUTHORITY
# SANTEE-COOPER POWER AND NAVIGATION PROJECT
## DOCKET NO. 4329-P-R
## ADVANCE NOTICE TO BIDDERS
## FOR
## MAIN SWITCHYARD — MISCELLANEOUS CONSTRUCTION
## AND
## TRANSMISSION LINES

It is expected that plans and specifications for constructing the Main Switchyard, Miscellaneous Construction and Transmission lines of the Santee-Cooper Project will be available for issue on or about April 1, 1941, and that bids will be received on or about May 1, 1941.

**DESCRIPTION:** Separate and combined bids are expected to be received on four schedules approximately as follows:

**Schedule 1—Main Switchyard and Miscellaneous Construction:** This schedule consists of constructing twelve forty-foot, 115 kv switchyard bays and twelve structural steel transmission towers. The site of the work will be down-stream and near the Pinopolis Power Plant which is located approximately four miles north of Moncks Corner, South Carolina. It includes structural steelwork, ground preparation, concrete foundations and cable tunnel, buses, disconnects, insulators and all work necessary to complete the switchyard except furnishing, wiring and installation of metering and relaying equipment, and furnishing of transformers and oil circuit breakers.

**Schedule 2—Transmission Lines:** This schedule will consist of furnishing and erecting complete approximately 75 miles of transmission line in two lines radiating from dead end towers near the above switchyard and extending to North Charleston and Bowman, South Carolina. The lines will be 115 kv, 3 phase, 60 cycle, single circuit, 4/0 Copperweld copper conductor, wood pole, H-Type frame construction with overhead ground wires and counterpoise if required.

**Schedule 3—Diversion Canal Control Structure:** This schedule will consist of constructing and operating a control structure approximately 200 feet long across the Diversion Canal located approximately 15 miles northwest of Moncks Corner, South Carolina. The structure will include steel sheet piling cutoff walls, concrete base, concrete piers, removable vertical structural steel frames, stop logs and associated items as necessary to complete the control structure.

**Schedule 4—Tailrace Transition:** This schedule will consist of constructing the concrete transition immediately below the Pinopolis Power Plant.

**AWARD:** Bids will be held not more than 30 days before award. Award will be made to the lowest combination of bidders which, in the opinion of the Engineer, is in the best interest of the Authority. The right will be reserved to reject any and all bids.

**BID BOND:** Bid bond in the amount of 5% of the bid will be required.

**PROCUREMENT OF PLANS AND SPECIFICATIONS:** Specifications covering the above described work including contract documents, forms, plans and specifications may be obtained, after issue, from the office of the Secretary of the Authority, Room 508, Peoples Building, Charleston, South Carolina, upon payment of $10.00 for the first set and $3.00 per set thereafter. In order to insure prompt receipt of documents it is suggested that orders be placed with the Secretary before the date of issue.

After issue, these documents may be examined at the offices of the Authority, Columbia and Charleston, South Carolina; at the offices of the Engineer, 27 Cumberland Street, Charleston, South Carolina, and 205 West Wacker Drive, Chicago Illinois; at the offices of the Associated General Contractors, Columbia, South Carolina, Charlotte, North Carolina, Raleigh, North Carolina, and Atlanta, Georgia, and at the plan room of the F. W. Dodge Company, Atlanta, Georgia.

**GENERAL CONTRACTOR'S LICENSE:** It is recommended that interested contractors familiarize themselves with the work beforehand and make application for general contractor's licenses under the South Carolina law. Detailed information regarding this law may be obtained from the South Carolina Licensing Board for Contractors, Jefferson Hotel, Columbia, South Carolina. The substance of the law is as follows:

**"Act of the General Assembly of South Carolina approved June 2, 1936, entitled 'An Act to Regulate the Practice of General Contracting in South Carolina' provides that general contractors (defined as anyone who, for a fixed price, commission, fee or wage, undertakes to construct or superintend the construction of any building, highway, sewer, grading or any improvement or structure where the cost of the undertaking is Seven Thousand Five Hundred Dollars ($7,500.00) or more), shall file a written application for general contractor's license with the South Carolina Licensing Board for Contractors (Columbia, South Carolina), *SAID APPLICATION TO BE FILED THIRTY DAYS PRIOR TO ANY REGULAR OR SPECIAL MEETING OF SAID BOARD* and to be accompanied by $20.00."**

Further information regarding the work may be obtained from the Harza Engineering Company, 27 Cumberland Street, Charleston, South Carolina, Telephone Charleston 5581.

**ATTEST:**

**CHARLES H. GERALD**
**Secretary**

**SOUTH CAROLINA PUBLIC SERVICE AUTHORITY**

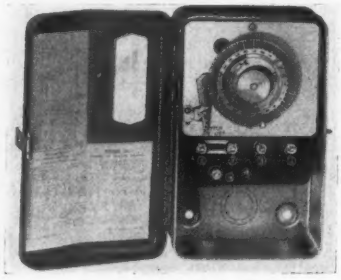
**By TOM B. PEARCE**
**Chairman**

Westinghouse Lamp Division. The new R-40 Mazda reflector lamp is the same as the 150-watt and 300-watt lamps except for wattage.

Rated average laboratory life is 1000 hours. Furnished with a medium screw base, the maximum overall length is 6½ inches and the lamp may be burned in any position. Reflecting surface is hermetically sealed on the inside of the specially blown bulb, and retains its high reflectivity throughout the life of the lamp.

### Paragon Time Switch

Paragon Electric Company time switches, of the new 300 Series, are high quality, precision instruments which sell at very reasonable prices. An outstanding feature is that it has just two exposed gears; all others operate in a sealed oil bath and consequently are always lubricated. It is not affected by dust.



Operation is accomplished by slow speed (450 R.P.M.) industrial type self-starting synchronous motor.

For actuating off-tripper — the most difficult operation performed — there is a reserve power of 40 pounds or an equivalent of 2000% of the power required. It operates successfully at temperatures as low as 20 degrees below zero. The case is compact, made of 18-gauge steel with a seamless drawn cover and base, streamlined and modern throughout. For further information, write Paragon Electric Company, Chicago, Ill.

### York Condensing Units

A compact, efficient, new line of self-contained refrigerating units varying in size from 1/5 to ½ hp is announced by York Ice Machinery Corp., York, Pa. The smallest unit stands 12⅜" high by 20" long by 15-1/16" wide and weighs 102 pounds.

The extra-compact model, which is used in York's own self-contained packaged units (refrigerators, beverage coolers, beer equipment, etc.) comes in three sizes: 1/5, ¼, and ⅓ hp, all air cooled. The model for remote location, outside the cabinet or cooling space, has fan and belt guards, rubber-cushioned legs, and is supplied in the following sizes; 1/5, ¼, ⅓ and ½ hp, air cooled; and ½ hp. water cooled.

### K-M Power Mix

Designed to make the most tiresome mixing job seem easy to the housewife, the Knapp-Monarch Power Mix provides ten distinct speeds with full power on each speed. Twin in-line beaters give complete mixing action, while the dual bowl position permits use of both large and small

mixing bowls, on a turn-table that will revolve in either position for thorough blending. The tilting motor can be removed easily for use at the range. Finished in white enamel, and regularly equipped with juicer attachment and two oven-proof bowls in white glaze finish, three- quart and one quart sizes. Extra available equipment: pea-sheller and bean-slicer; vegetable-slicer and grater; meat grinder.

### UD Transformer Bulletin

R. E. Uptegraff Manufacturing Company, Scottdale, Pa., have just issued Bulletin No. 112, on Uptegraff Type UD distribution transformers. These UD transformers have cylindrical tank or case, electrically welded, designed particularly for complete year-around outdoor protection, and are built in capacities of 1½ to 100 kva. The bulletin gives complete illustrations and description, and a copy may be had by addressing the Uptegraff Company.

### Hygrade Miralume Catalog

The new Hygrade Miralume catalog available from the Miralume Division, Hygrade Sylvania Corporation, Ipswich, Mass., contains both interesting and helpful lighting data. It includes a complete story on that newest of all lighting methods—fluorescent, and on Hygrade Miralumes. Not only does it include a number of interesting background facts, but also complete directions on how to obtain the maximum satisfaction from any Miralume installation.

### Insulation Guide Book

A new edition of the "Guide Book of Electrical Insulating Materials," published by the Mitchell-Rand Insulation Co., Inc., 51 Murray Street, New York, has just been announced. The book contains 43 pages of catalog data. In addition to specifications and prices on insulating papers, cotton tapes and webbings, asbestos tape and sleeving, it contains data on a wide range of Fiberglas products. The catalog lists a number of items of particular interest to motor rewinding shops.


# BRIEGEL METHOD
# Production Now DOUBLED!

Yes, we'll admit that your orders for the BRIEGEL METHOD fittings flooded in on us far faster than we anticipated.

## and NOW . . .

Production facilities have been doubled . . . a complete battery of new, automatic machines is in operation. We're very grateful for the patience of our Jobber and Contractor friends.

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Triangle Conduit & Cable Co., Elmhurst, New York City

**BRIEGEL METHOD TOOL CO., Galva, Illinois**

## Attractions Offered at Exchange Conference

*(Continued from page 11)*

Kenneth Crawford, Washington correspondent, *PM Newspaper,* a scribe's viewpoint of the utility industry; Chas. W. Smith, chief, Bureau of Accounts, Finance and Rates, Federal Power Commission, Washington, historical costs of property; F. J. McDiarmid, Investment Research Department, Lincoln National Life Insurance Co., Ft. Wayne, private utility financing from the point of view of an institutional investor; Dr. Wm. P. Jacobs, chairman, South Carolina Council for National Defense, and president of Presbyterian College, Clinton, S. C., "Power—Pioneer of Progress"; Prof. Erwin H. Schell, Department of Business and Engineering Administration, Mass. Institute of Technology, Cambridge, industrial management and employee relations; and R. Paul Smith, president, Potomac Edison Co., Hagerstown, Md., "The Utility Balance Now on the Way Up—Then on the Way Down."

The program will include an address by the Exchange president, A. W. Higgins, who will preside over the sessions. Reports also will be heard from section chairmen which include Lewis Payne, president, Eastern Shore Public Service Co., Salisbury, Md., engineering and operation section; R. B. Roberts, general sales manager, Florida Power and Light Co., Miami, sales section; P. R. Williams, comptroller, Virginia Electric and Power Co., Richmond, accounting section; and J. M. Stafford, assistant advertising manager, Georgia Power Co., Atlanta, employees activities committee.

In order that full advantage can be taken of the varied recreational facilities available in and near Augusta, the business program will consist of three intensive morning sessions and one evening session, leaving afternoons open. Golf will be available at both the Augusta Country Club and the National Golf Club with a special tournament for men on Friday afternoon.

## Connection Diagrams For Lap-Wound Motors

*(Continued from page 40)*

in square inches for both cases.

When redesigning a high voltage winding to a lower voltage, use can be made of parallel connections to reduce the turns. For example, consider a six-pole, 2200-volt winding, that we want to operate on a 220-volt circuit. The present winding is connected series delta for 2200 volts. Then from Table I it is to be noted that the turns must be multiplied by 0.1 to reduce them to the proper amount.

But with six poles, we can use either a six-parallel star or delta connection. Then, consulting Table I of March 1941 issue, we find that a six-parallel delta connection will reduce the voltage to 2200 x .167 = 367.4 volts.

Thus the new winding can be changed to six-parallel delta and the turns per phase reduced in the proportion of 220/367 or to 0.6 times the original turns per coil and the copper area increased in the ratio of 367/220 or 1.67 times the area required for the 220 volt rating.

Thus Table I in this article can be used in conjunction with Table I of the March 1941 issue, as the turn multiplier can be used as the finding factor for the table previously published.

The next article will present the twelve-pole, three-phase, two-parallel diagrams, and in addition will discuss the effect of over voltage on windings.

## Southeastern Engineers Hold Conference

*(Continued from page 32)*

this period also indicate that there is no appreciable difference in the rate of deterioration between the oils in the tap-changer compartment and the transformer compartment. "Most operators have placed step regulators on a four or five year inspection program," he said, "and it is believed safe to predict that after a few more years of operating experience, the average inspection program will be on a 10-year basis, if not longer."

No paper evoked quite as much discussion from the floor as that presented by I. W. Gross, engineer, American Gas and Electric Service Corp., on the "Use of Protective Equipment When Working on Live Lines or Equipment of Various Voltages." After reviewing the requirements for live line mainten-


**Greenlee Benders Can Save 15 to 75% On Bending Costs**

The No. 770 Bender, shown above, has a maximum pressure of 25 tons for bending 1¼ to 3-inch conduit, while the larger No. 775, with a maximum pressure of 40 tons, will bend 3 to 4½-inch conduit.

**Greenlee Hydraulic Benders can save you 15 to 75% on labor and material costs on every bending job. You can lower labor costs because one man can bend conduit and pipe easier and faster with Greenlee Benders, and you eliminate the cost of many manufactured bends because bending is done cold right on the job. Built compactly into one unit, these benders are easily carried to the job and set up, and will not move and twist about when in use.**

• SEND FOR NEW BENDER BOOKLET

Write today for free new booklet describing the complete line of Greenlee Hydraulic Benders for rigid and thin-wall conduit, pipe, and bus-bars, and the Greenlee Hand Benders for steel, copper, brass, and aluminum tubing. Ask for S-116 Bender Booklet.

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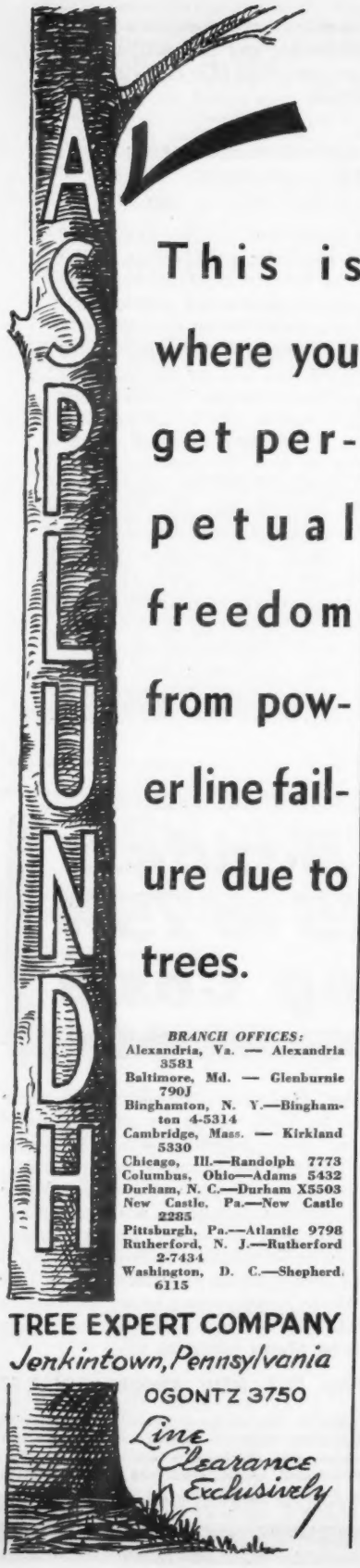
ASPLUNDH
This is where you get perpetual freedom from power line failure due to trees.
BRANCH OFFICES:
Alexandria, Va. — Alexandria 3581
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Binghamton, N. Y.—Binghamton 4-5314
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Chicago, Ill.—Randolph 7773
Columbus, Ohio—Adams 5432
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New Castle, Pa.—New Castle 2285
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TREE EXPERT COMPANY
Jenkintown, Pennsylvania
OGONTZ 3750
Line Clearance Exclusively

ance and the protective equipment used, Mr. Gross discussed in detail the limitations of protective methods and equipment.

Summarizing, Mr. Gross asserted that "equipment of from 0 to 300 volts presents no particularly difficult problem and can usually be handled hot, if required, by the use of light protective equipment such as insulating gloves, tools, mats, barriers, etc.

"In the 300 to 4000 volt range the use of rubber protective equipment with suitable barriers, where required, is generally accepted and has worked out satisfactorily.

"In the range from 4000 to 13,200 volts, opinions and practices differ. In some cases rubber equipment in combination with other insulation such as wood is employed. As a third means hot line tools only are used.

"Above 13,200 volts, hot line tools only have been generally accepted and have been giving, from available records, satisfactory results.

"In the controversial range between 4000 and 13,200 volts, present indications point strongly to the desire on the part of some groups to use rubber equipment alone or in combination with insulation such as platforms, stools, ladders, etc. The possibility of this procedure being thoroughly justified seems to be only a matter of time, particularly in view of the generally recognized better rubber equipment available today than in the past and the advent of additional protection such as insulating hats, spur guards, and rubber overshoes. The indications seem to be quite strong that this procedure is technically sound and that experience will show that it should justify an approved accepted practice.

"Theories and practices that were good enough when maintenance of hot lines was first started will have to give way to new ideas and equipment based on sound theory and backed by satisfactory experience, as the requirements of the industry change."

### Operating Rural Lines

A strong defense for the "district representative" plan of operation was presented in a paper entitled "Operating Rural Lines," by W. L. Rush, Louisiana Power and Light Co. This system has worked out most successfully in the area served by this company which is predominantly rural. A total of 50,212 customers are served over 3,228 miles of transmission and distribution line, the average density being approximately 15 customers per mile of line.

"Some rural customers are served from 2.4 kv lines," Mr. Rush told the Section, "but the balance of our territory is served either at 7.6 kv or 13.8 kv. In fifteen places where a neutral was not available and we wanted to build long rural lines, an isolating transformer was installed and the line built at 7.6 kv. In isolated cases we have built one wire lines or established a neutral and run them as 7.6 kv. We have not experimented any trouble from these experiments but a large majority of these lines are 13.8 kv, single phase. At this time when aluminum is scarce, our rural lines are being built mostly of No. 6 hard drawn copper with a 550 foot ruling span and 35 foot Class 7 poles.

"We have not experienced any serious maintenance problems. We have our territory divided into three divisions with heavy construction crews and 35 districts with light crews for maintenance and light construction. Last winter, and particularly January, 1940, was the most severe in many years. There was over a foot of snow that stayed on the ground for several weeks and below zero temperature in the northern part of the state. There was one sleet storm that covered practically the entire State. We had one dead end pole that broke when the guy snapped but nearly 100% of our trouble was caused from trees—pine saplings bent from the ice load and dropped over the lines causing fuses to blow and breakers to trip.

"A large amount of our routine maintenance is handled by our meter reader and service trucks. These men are trained to patrol the line as they make their routine trips, and if they see anything that needs to be done, they do it. At the time if possible, or if not, make a note of it and we have it done later.

"The most serious part of our maintenance is the lack of telephones. We serve sections of the state where there isn't a telephone within ten or fifteen miles, and the customer isn't able to notify of his trouble without either writing us or else stopping a car on the way to town and asking that they notify us. The Telephone Company is now

getting farther into these rural areas and that will help these conditions.

"As service calls into these rural areas often mean trips of from 50 to 100 miles, it is essential that the need for them be eliminated as much as possible. To accomplish this, we are installing oil circuit breaker service restorers on our branch lines instead of fuses. Some of them have now operated from 200 to 300 times without ever locking out and without requiring any maintenance work. We credit this better performance to the time delay between operations that permits the trouble to clear itself. Also, in an effort to whip this fuse trouble, we use a large number of CSP transformers. On our conventional transformers we have quit using the small amperage fuse links and now do not use any primary fuse smaller than 5 amps. which will withstand most of the surges, and we secure our overload protective by installing secondary fuses."

### Service Studies

A paper presented jointly by P. B. Boyd, underground engineer, and R. O. Loomis, distribution engineer, both of Georgia Power Company, discussed the problem of serving customers from underground vaults supplied from overhead distribution systems.

The authors pointed out that installations of this kind introduce the use of cable, potheads and cable joints, the failure of which would result in a lengthy interruption of service—a condition to which customers supplied from the average overhead installation would not be subjected. Despite the fact that service from such vaults is apt to be worse than the service to customers supplied with overhead transformers, the very customers who are served from such vaults are frequently the ones who would be most affected by a lengthy interruption.

The authors then presented a number of different schemes by which service could be improved for customers served from this type of vault. For each of these schemes, the probable annual outage in minutes was calculated and the increased cost of the equipment required above that of the basic scheme was divided by the minutes of outage saved. The average annual minutes of outage for the different schemes varied from 2 to 88 minutes. However, the authors found the least cost per kva, per annual outage-minute saved in a non-submersible installation which included duplicate 4-kv 3-conductor cables with potheads at both ends of the spare but with only one bank of transformers.

In the discussion that followed, special interest was indicated in this paper because of the authors' use of the laws of probability in arriving at annual outages expected with various equipment arrangements and connection schemes.

"Trained manpower will probably be one of our greatest needs," W. E. Shafer, of Virginia Electric and Power Company, told the conference in his discussion of personnel problems and national defense. "Based upon the rather certain assumption that the world crisis will not be dissipated in a short time, the forthcoming events will require our utmost vigilance to anticipate the many problems that will develop in the important role the electric industry has in the national defense program."

Mr. Shafer described his company's policy with respect to employees entering military service. Gaps in the company organizations caused by national defense activities, so far, have been taken care of in a majority of cases by reallocation of work and rearrangement of personnel.

G. D. McCann, of Westinghouse Electric & Mfg. Co., reviewed some of the fundamental principles relating to "traveling waves" on transmission lines. An interesting feature of his talk was the demonstration that accompanied it, making use of the ingenius device for mechanical analogy of transmission line surges developed by C. F. Wagner, transmission consulting engineer for Westinghouse.

## Overcurrent Protection Code Rules Changed

(*Continued from page 24-C*)

The operation of fuses in multiple is still permitted, upon the same basis as in the 1937 Code. However, the requirements now are more stringent and fuses can only be operated in multiple if they are: (1) of the same type, (2) have the same characteristic, i.e., time-load curve, and (3) have the same rating.

The above standard is much more logical than the old requirement which simply stated that fuses had to be of "equal capacity." This rule ignored entirely the fact that the time-load characteristic of the fuses could be en-

"IT SAYS HERE IN THE BOOK"

| | Maximum number of conductors | | | |
|---|---|---|---|---|
| | No. 14 | No. 12 | No. 10 | No. 8 |
| 3¼-inch octagon box | 5 | 5 | 4 | — |
| 4-inch octagon box | 8 | 7 | 6 | 5 |
| 4-inch square box | 11 | 9 | 7 | 5 |

But if I use two clamps, I must *deduct* two conductors. If I use a fixture stud, I must *deduct* another conductor!

HERE'S THE ANSWER!

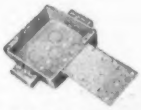
The J-K line of boxes—that's it! The clamps being on the outside of the box, will permit the use of *two more conductors* than the conventional internal-clamp-type box. No space is wasted inside the J-K box. The external clamp renders a *smaller* J-K box as efficient as a *larger* conventional box with internal clamps.

For Both Metallic and Non-Metallic Cables

The J-K box is equally suitable for, and can be used interchangeably with either metallic or non-metallic cable—or both types in the same box if desired.

RACO ● ALL-STEEL developed and pioneered the J-K box. Over a period of years, it has gained an ever increasing *national acceptance*. Although many attempts have been made to equal its efficiency, no other box can serve the same wide range of utility as the genuine J-K box!

Write today for the catalog—containing all the facts about the J-K box and many other nationally famous RACO ● ALL-STEEL electrical products.



*4-inch Square*

*4-inch Octagon*

*3¼-inch Octagon*

*and Appropriate Assemblies of J-K Boxes and Bar Hangers.*

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ALL-STEEL PRODUCTS
Switch Boxes • Outlet Boxes • Cutout Boxes
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ATLANTA, GA.....W. R. Calverly
TAMPA, FLA. ..... Pat Baldwin, Inc.
SUMMERVILLE, S. C.....J. P. Voight
NEW ORLEANS, LA....Electron Eng. Co., Inc.

BIG *Lighting* BUSINESS
INDUSTRIAL—SPORTS—SERVICE STATIONS

Pole available with or without signs. For service station, sports or industrial use.

Revere

THE ONLY COMPLETE LINE OF FLOODLIGHTS AND POLES

Cash in on the big demand for Industrial Protective Lighting — also the wonderful year 'round volume of floodlight and pole business from Service Stations and Sports-Field Buyers.

Revere No. 3313 Enclosed - Type Flood for high mounting. One of many in Revere Line.

Low - Mounting Convertible Floodlight. Has a multitude of uses.

THE HINGED POLE lowers Floodlight for ground-level cleaning. Promotes safety.

Write for catalog. Let us help you with your lighting problems.

REVERE ELECTRIC MFG. CO.
2437 NORTH PAULINA STREET, CHICAGO
*Originators of the Hinged Floodlight Pole*
INDOOR and OUTDOOR LIGHTING EQUIPMENT of EVERY DESCRIPTION

tirely different. A 400 ampere "time lag" and a 400 ampere standard cartridge fuse certainly should not be operated in multiple.

Two completely new sections have been added to the rules governing the use of enclosures for overcurrent devices. Both sections have been developed as safeguards against accidental hazards.

### Two New Sections Added

The first new section, 2440, requires individual disconnects for each circuit, ahead of each set of fuses or thermal cutouts if: (a) the circuits are more than 150 volts to ground, or (b) the circuits are accessible to other than qualified persons. This will permit each individual circuit to be independently disconnected from all sources of supply and thus allow unqualified persons to handle these fuses and cutouts while they are unenergized.

The Code permits a single disconnect for a group of fuses or cutouts serving a number of motors driving various parts of a single machine. A crane, a hoist, a woodworking machine, all have various components driven by individual motors, which are independently protected by fuses and cutouts, but usually controlled as a group by a single disconnect. This new section provides for an exception to the rule stated in the above paragraph for installations of this type and accepts the single disconnect as offering ample protection to unqualified persons attempting to service each individual fuse or cutout of the machine. In most cases these machines operate as a unit. Any one motor or circuit which is rendered inoperative for any reason, will require the closing down of the entire machine until this one defective branch is cleared up. Therefore, a single disconnect is sufficient and most practical for such hoists, machines, etc.

It should be noted that this requirement specifically states that the rule shall only apply when unqualified persons will operate the equipment. The inspectors cannot continually police such installations so that it will be most logical for him to require the fulfillment of these rules in practically all installations.

A fine print note appended to this section recommends the application of the rules of this section to all installations operating at 150 volts to ground or less. It further suggests that the protection be provided where cartridge fuses are used for the overcurrent device.

The following section, 2441, provides further safeguards to the operator of the electrical equipment. Many switchboards, panelboards, and control panels are not completely enclosed. It is quite possible for the arc of an opening circuit breaker or the flash of a blown fuse to burn or injure the operator if these are not properly located or shielded. This new Code section, therefore, has a mandatory requirement for such construction to protect the operator.

The second requirement of this section provides for guarding or isolating the handles and levers of circuit breakers. These usually operate very quickly and suddenly and if they strike anyone within range of operation can severely and even fatally injure them. These should preferably be protected by some guard rail to keep everyone at a safe distance, except when they are to be manually handled by the operator.

This completes the general discussion of the Code changes with reference to the previous articles

In St. Louis, Hotel Mayfair is the choice of seasoned travelers. They appreciate its downtown location and enjoy its friendly, restful atmosphere, courteous service, comfortable rooms and its restaurants where fine food and drink are traditional.

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appearing in this series. Beginning with the next discussion of Article 250 on Grounding, the Code discussions will completely cover all the requirements of each section based on the new 1940 Code.

## The "Forty-Niners of 1941" Lighting Campaign

(*Continued from page 14*)

published in Light Magazine. The judging and awarding of this prize will be made on the basis of the best lighting for the job involved. A committee composed of Ward Harrison, C. E. Weitz and H. F. Barnes, all of Nela Park, will make the selections.

This special award will offer competition for the outstanding lighting salesmen in the country.

Supplementing the awards of the G-E Forty-Niner campaign, the Georgia Power Company will offer its lighting salesmen a series of "Bonanza" awards, according to announcement by Philip Peeples, manager of lighting sales division. In order to share in these awards, the lighting salesman must sell two or more qualifying jobs that are installed during the period April 1 to September 1, 1941.

Various awards will be made to the Forty-Niner who sells a second, third and fourth qualifying job. In addition, special awards will be made to the Forty-Niner selling the largest number of qualifying jobs and for the best all-round qualifying job from an engineering and selling viewpoint. A trip to Nela Park to attend the advanced commercial and industrial lighting school in October will be awarded the Division Lighting Supervisor who has the highest ratio of qualifying jobs per salesmen during the contest period.

## Laboratory for Rural Electrification Work

(*Continued from page 9*)

tric laundries. The basement contains an "electric farm" including a dairy center, poultry center, a farm workshop, and a "barn" with its feed cutting, grinding and mixing equipment, as well as miscellaneous appliances that range from an all-purpose farm refrigerator and water systems to cattle clippers, ice cream freezer, poultry house lighting unit, and "electro-pail."

Every appliance and every machine is in working order. Camp visitors may grade or candle eggs on the electric grader and the candler, grind feed in the feed grinder, cook meals in the kitchens, wash and iron clothes in the laundries, shell corn in the corn sheller, brood chicks in the brooders, sharpen a scythe on the electrified grindstone, or perform an electric welding or drilling job.

### Manufacturers Represented

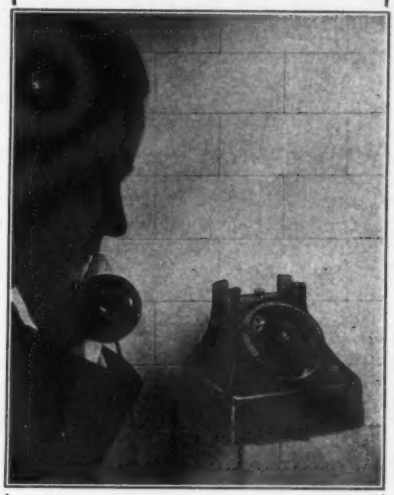
Most leading appliance and equipment manufacturers are represented in the Jackson's Mill laboratory and a single kitchen may contain the products of a dozen different firms. Equality of display reigns throughout the building and no manufacturers can feel that his products are being slighted.

The main auditorium stage contains a complete kitchen, primarily for demonstration work before large groups and classes. The three principal "working" kitchens include: a "U" type, constructed to show how a family may take an ordinary farm kitchen and by careful planning turn it economically into the modern work center; a common "L" type kitchen; and a "parallel wall" model. All of the kitchens are compete with [illegible] and convenient working surfaces.

The "U" kitchen represents the modernization of an ordinary, jumbled farm kitchen which was the rule before the coming of electricity. With special wooden models of every piece of equipment, cabinets, sinks, and working surfaces, built to scale, the laboratory staff can construct such a kitchen, step by step, just as a farm family would do it year by year, in changing from the old to the new. With the actual kitchen as a model and following the step-by-step method outlined in the laboratory demonstration, any farm family can remodel its own kitchen in a like manner for about $125, exclusive of the appliances. More expensive steel and other material could be used if the farm could afford it.

To mention all of the appliances and machines which are on display and can be demonstrated at the West Virginia laboratory would involve the listing of practically every type of electrical equipment that exists. The only item that anyone has missed to date has been an electric incubator, and probably that, too, will be added shortly. As proof

NEW



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that the various "centers" are complete, consider the "dairy" where there is a milk cooler, an aerator, sterilizer, bottle washer, milking machine, refrigerator, churn, ice cream freezer, cattle clippers, infrared lamp for caked and sore udders, an electric fence, and an electric fly sprayer, as well as some other items.

In the lighting room, for instance, there are fixtures, both indoor and outdoor, bulbs and shades of every description, wiring diagrams for the farm home, barn, and other outbuildings, meters, switches, samples of wires, light meters, insulators and insulation, and a story of electricity "from the power station to the farm."

A laboratory kitchen isn't complete without its range, refrigerator, dishwasher, waste disposal unit, proper lighting, clock, radio, toaster, grill, percolator, waffle iron, casserole, etc. But despite the "completeness," visitors find the stress laid on "building" the kitchen by yearly purchases of equipment. Nowhere is a farm family urged to try a complete job of modernization all at once unless it can afford it.

Amid the maze of deep and shallow well and ejector pumps, electric motors, drill press, soldering iron, hammer mills, soil heating units, brooders, feed grinders, electrically operated lathe, wood sawing outfit, egg graders, and other equipment, there is something that every farm family and very member of that family has an interest in.

Over 20,000 rural West Virginia families have received electric service in the last five years. The state extension division sees in the Jackson's Mill laboratory a chance to help these farmers use electricity more efficiently and to take advantage of its many applications in building a more profitable agriculture, in relieving drudgery, in promoting convenience, in short, promoting "farming for better living."

### Load-Building Possibilities

The utilities' investment might be termed a "selfish" one, for while they are proving through actual demonstrations that electricity does "do it better" on the farm and in the farm home, they are selling those farm families on the value of electric service and are making "satisfied users" of their customers. Impetus is given to new line extensions because camp visitors who do not now have wired homes are apt to be more desirous of the advantages which electricity can bring them, after they've been to Jackson's Mill. There's also a possible solution to the utility problem of the thousands of potential customers who live along existing lines, but for one reason or another, not always financial, have never been connected.

Preliminary training in proper wiring and lighting and in the selection of appliances to fit the individual farm will save a lot of time and trouble when the new farm line is actually energized, because an informed customer is always a better customer. So, to the utilities, we say the laboratory means the sale of more kilowatt-hours.

The actual use demonstrations—based on the theme that a picture is worth 1,000 words and a demonstration is worth 10,000—probably accomplish more for the equipment manufacturer in the way of future sales than would a dozen salesmen. Although actual selling is forbidden in the laboratory, or on the camp grounds, too, for that matter, dealers are ready to admit that the laboratory, with only one year behind it, is furnishing a "flock of leads."

At the end of 1940, much of the equipment in which radical changes in models have taken place was offered for sale by the manufacturers at reduced prices and lots of farmers got good bargains in "demonstrator" equipment. When the camp season opens in late April of this year, shiny new appliances and machines will replace the items which are now out-of-date.

The Jackson's Mill laboratory will never be finished—can never be finished, because it is dedicated to progress in rural electrification. It opens a new field of cooperation between utilities, the extension division, equipment makers and the dealers in selling electricity's advantages to the farmer. It will always remain a model of what's new in electricity for the farm and the farm home. It is doing a job—and doing it well.


## FOR SALE

40 Practically new No. 2579 Wheeler Mercury Vapor Reflectors, complete with boxed transformers and lamps, $11.00 each, F.O.B. Asheboro, N. C. Subject to prior sale. Address Box 69, care ELECTRICAL SOUTH, Grant Bldg., Atlanta, Ga.

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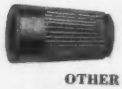

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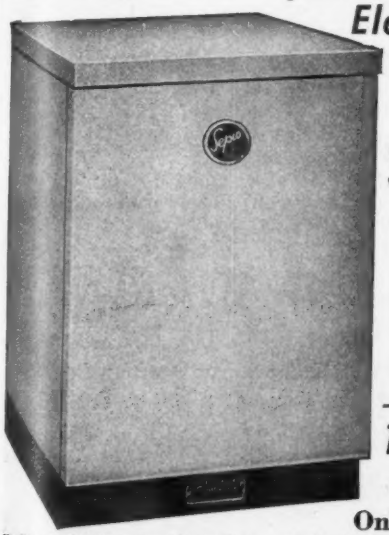

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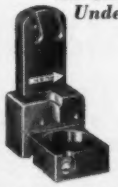

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